



DEPARTMENT OF THE AIR FORCE
AIR FORCE INSTITUTE FOR OPERATIONAL HEALTH (AFMC)
BROOKS CITY-BASE TEXAS

NOV 14 2005

MEMORANDUM FOR 9 CES/CEVQ

ATTN: MR. RUBEN V. SARABIA
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FROM: AFIOH/RSE

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SUBJECT: Letter, IOH-RS-BR-LT-2005- 0057, 2004 Mobile Source Air Emissions Inventory for Beale AFB, California

1. At the request of Ms. Christa Winnie, HQ-ACC/CEVQ, the Air Quality Branch of the Environmental Consulting Division of the Air Force Institute for Operational Health (AFIOH/RSEQ) conducted a comprehensive mobile source emissions survey at Beale AFB, California. The inventory provided estimates of 2004 criteria pollutant and hazardous air pollutant emissions from mobile sources including aircraft, aerospace ground support equipment (AGE), government owned road and non-road vehicles/equipment, ground maintenance equipment, and privately owned vehicles.
2. Matt Miller, Jesse Alonzo, Mark Wade, and Maj David Torres conducted the survey. The air emission survey at Beale AFB was conducted in two phases. The first phase included an on-site survey of the installation, which was conducted from May 16 - 20, 2005. During the site visit, data was gathered on aircraft operations, aircraft engine testing, AGE operation, government and private vehicle on base usage, and road and non-road vehicles/equipment. Installation personnel were interviewed and other necessary information was gathered for the calculation of air pollution emissions. The second phase of the inventory involved converting field data into source-specific emission rates.
3. We appreciate the support your office provided to our study team and we look forward to working with you in future environmental efforts. If you have any technical questions concerning the report, please contact Maj. David Torres at DSN 240-4859 or email at david.a.torres@brooks.af.mil or Mark D. Wade at DSN 240-4858 or email at mark.d.wade.ctr@brooks.af.mil. We are committed to providing the absolute best quality of services possible. If you have comments on the quality of our services please contact me at DSN 240-3305 or email me at allen.naugle@brooks.af.mil. You can also reach us at our website <http://www.brooks.af.mil/afioh>

ALLEN R. NAUGLE, Lt Col, USAF, BSC
Chief, Environmental Consulting Division

Attachment:

2004 Mobile Source Air Emissions Inventory for Beale AFB, California

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**2004 Mobile Source Air Emissions Inventory
Beale AFB, California**

Prepared For:

9 CES/CEVQ
Beale AFB, CA



Prepared By:

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September 2005

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LIST OF ACRONYMS

| | |
|------------|--|
| ACC | Air Combat Command |
| AEI | Air Emissions Inventory |
| AFB | Air Force Base |
| AFI | Air Force Instruction |
| AFIOH | Air Force Institute for Operational Health |
| AFIOH/RSEQ | Air Quality & Hazardous Waste Branch of AFIOH |
| AGSE | Aerospace Ground Support Equipment (historically referred to as AGE) |
| AQM | Air Quality Manager |
| AW | Airlift Wing |
| ARW | Air Refueling Wing |
| BSFC | brake-specific fuel consumption |
| Btu | British thermal unit |
| CAA | Clean Air Act |
| CES | Civil Engineer Squadron |
| CFR | Code of Federal Regulations |
| CO | carbon monoxide |
| CY | calendar year |
| EF | emission factor |
| gal | gallon |
| g | gram |
| GOV | government own vehicle |
| GVW | gross vehicle weight |
| HAP | hazardous air pollutant |
| HDDV | heavy duty diesel vehicle |
| HDGV | heavy duty gasoline fueled vehicle |
| hp | horsepower |
| hr | hour |
| IC | internal combustion |
| ICE | Internal Combustion Engine |
| ID | identification |
| lb | pound |
| LDDT | light duty diesel-fueled truck |
| LDGT1 | light duty gasoline-fueled truck, type 1 |
| LDGT2 | light duty gasoline-fueled truck, type 2 |
| LDGV | light duty gasoline-fueled vehicle |
| LFB | Low fly by |
| LFP | Low fly pattern |
| LPG | liquefied petroleum gas |
| LRS | Logistics Readiness Squadron |
| LSGI | Low Speed Ground Idle |
| LTO | Landing and Takeoff |
| MC | Motorcycle |

LIST OF ACRONYMS (Continued)

| | |
|------------------|--|
| MEK | methyl ethyl ketone |
| min | minute |
| MOGAS | motor vehicle gasoline |
| MTBE | methyl tert-butyl ether |
| MW | molecular weight |
| N/A | not applicable |
| NAAQS | National Ambient Air Quality Standard |
| ND | Non Detectable |
| NO _x | oxides of nitrogen (or nitrogen oxides) |
| PAH | polycyclic aromatic hydrocarbon |
| PM | particulate matter (considered synonymous with TSP) |
| PM ₁₀ | particulate matter with an aerodynamic diameter less than 10 microns |
| POM | polycyclic organic matter |
| PTE | Potential to Emit |
| POV | Privately owned vehicle |
| P/U | Pickup |
| RW | Reconnaissance Wing |
| SO _x | oxides of sulfur (or sulfur oxides) |
| SVS | Services Squadron |
| TGO | touch and go |
| THC | total hydrocarbons |
| USEPA | United States Environmental Protection Agency |
| VOC | volatile organic compound |
| yr | year |

Executive Summary

In its efforts to actively manage the air emissions programs of its respective bases, Headquarters Air Combat Command (ACC) requested the Air Quality Branch of the Environmental Consulting Division of the Air Force Institute for Operational Health (AFIOH/RSEQ) to conduct a comprehensive mobile source air emissions inventory (AEI) for Beale Air Force Base (AFB). This inventory was accomplished during May 2005 for calendar year CY) 2004 emissions. The purpose of the inventory was to provide Beale AFB with a mobile source AEI to meet the requirements of Air Force Instruction (AFI) 32-7040, *Air Quality Compliance*, which directs installations to “Prepare and periodically update a comprehensive base air emissions inventory.”

Beale AFB is located in Yuba County, California. Yuba County is part of USEPA Region 9, which is currently designated a maintenance area for ozone (O_3). This air emission inventory will be used to document actual mobile source emissions and for background data for conformity reviews. The results of the emissions inventory can be used as a baseline to determine potential impacts of future mission changes and provide information for health risk assessments.

Sources inventoried at Beale AFB include aircraft stationed at Beale as well as aircraft stationed elsewhere (transient aircraft), aerospace ground support equipment, government owned vehicles, privately owned vehicles, and Non-road vehicles/Non-vehicular equipment operated on Beale AFB.

Criteria and hazardous air pollutant emissions from all mobile sources at Beale AFB are shown in Table ES-1 (page ES-2) and Table ES-2 (page ES-3), respectively. Typically mobile source emissions are four to seven times greater than stationary emissions. Emissions from mobile sources are not presently regulated, unless the sources are located in a non-attainment area and if proposed new emission increases are considered regionally significant or exceed specified de minimis rates under the Clean Air Act Amendments conformity regulations. If the emission increases are deemed regionally significant, a base may either have to install controls on existing equipment or purchase emission credits from either the state or private industry. The Clean Air Act Amendments and conformity regulations require government organizations to evaluate the environmental impacts of operational changes (a change in aircraft, the addition of a new squadron, or any other major change where air pollution emissions may significantly increase).

The 2004 inventory was the first comprehensive mobile source emissions inventory prepared for operations at Beale AFB. As a result, some operational data, used for calculating mobile source emissions, was not required to be tracked by base personnel. To improve the accuracy of future inventories, AFIOH suggests the following recommendations:

- Maintain fuel usage records (fuel usage/fuel burned usage amounts are currently not tracked), and time-in-mode settings for on-wing engine tests for all aircraft,

- Maintain operating records on trim pad testing.
- Aerospace ground support equipment (AGE) flights should maintain fuel usage records for each type of AGE.

Table ES-1 2004 Criteria Pollutant Emissions from Mobile Sources at Beale AFB

| Emission Source | NO _x (lbs/yr) | CO (lbs/yr) | VOC (lbs/yr) | PM ₁₀ (lbs/yr) | SO _x (lbs/yr) |
|---|-----------------------------|---------------------|-------------------|------------------------------|-----------------------------|
| Aircraft Stationed at Beale AFB | 231,010.50 | 446,449.41 | 133,716.62 | 72,380.93 | 47,245.31 |
| Aircraft Not Stationed at Beale AFB | 2,629.43 | 53,270.03 | 5,022.43 | 2,922.90 | 877.62 |
| On-Wing Aircraft Engine Testing | 3,193.79 | 7,069.18 | 4,933.26 | 1,807.04 | 764.97 |
| Aerospace Ground Support Equipment | 47,845.40 | 13,934.50 | 4,220.70 | 1,517.60 | 2,390.00 |
| Government Owned Vehicles | 11,241.18 | 96,444.26 | 10,347.22 | 3,368.21 | 592.43 |
| Privately Owned Vehicles | 30,813.72 | 394,311.66 | 24,606.73 | 504.26 | 3,108.44 |
| Non-road vehicles/Non-vehicle Equipment | 21,499.59 | 91,958.66 | 11,551.14 | 2,717.11 | 1,937.81 |
| Total (lbs/yr) | 348,233.61 | 1,103,437.70 | 194,398.10 | 85,218.05 | 56,916.58 |
| Total (tons/yr) | 174.12 | 551.72 | 97.20 | 42.61 | 28.46 |

Table ES-2 2004 Hazardous Air Pollutant Emissions from Mobile Sources at Beale AFB

| Emission Source | Acetaldehyde (lb/yr) | Acrolein (lb/yr) | Benzene (lb/yr) | 1,3 Butadiene (lb/yr) | Ethylbenzene (lb/yr) | Formaldehyde (lb/yr) | Hexane (lb/yr) | Lead (lb/yr) | Methyl Ethyl Ketone (lb/yr) | Methyl Tert-Butyl Ether (lb/yr) | Naphthalene (lb/yr) | PAH (lb/yr) | Propionaldehyde (lb/yr) | Styrene (lb/yr) | Toluene (lb/yr) | Xylene (lb/yr) |
|---|-------------------------|---------------------|--------------------|--------------------------|-------------------------|-------------------------|-------------------|-----------------|-----------------------------------|---------------------------------------|------------------------|----------------|----------------------------|--------------------|--------------------|-------------------|
| Aircraft Stationed at Beale AFB | 217.47 | 170.62 | 96.57 | N/A | 12.02 | 2,601.75 | N/A | N/A | 79.80 | N/A | 84.35 | N/A | N/A | 12.73 | 76.36 | 67.65 |
| Aircraft Not Stationed at Beale AFB | 15.55 | 14.71 | 29.74 | N/A | 2.80 | 130.35 | N/A | N/A | 4.05 | N/A | 9.45 | N/A | N/A | 76.17 | 12.09 | 7.44 |
| On-Wing Aircraft Engine Testing | 1.08 | 0.90 | 1.36 | N/A | 0.10 | 18.98 | N/A | N/A | 0.69 | N/A | 0.64 | N/A | N/A | 0.14 | 1.00 | 0.65 |
| Aerospace Ground Support Equipment | 4.70 | 0.06 | 5.70 | 0.22 | 0.07 | 7.40 | 0.53 | N/A | N/A | N/A | 0.53 | 1.00 | N/A | N/A | 2.50 | 1.80 |
| Government Owned Vehicles | 44.38 | N/A | 152.56 | 27.19 | N/A | 1,200.00 | N/A | 4.64 | N/A | 46.52 | N/A | N/A | N/A | N/A | N/A | N/A |
| Privately Owned Vehicles | 148.39 | N/A | 1,236.32 | 153.07 | N/A | 381.40 | N/A | 59.82 | N/A | 412.96 | N/A | N/A | N/A | N/A | N/A | N/A |
| Non-road vehicles/Non-vehicle Equipment | 7,096.54 | 6,906.31 | 6,974.66 | 6,880.58 | 6,921.16 | 7,323.37 | 6,900.10 | N/A | N/A | 7,118.89 | N/A | 6,922.05 | 6,901.28 | 6,875.36 | 7,081.28 | 7,084.48 |
| Total (lbs/yr) | 7.5E+03 | 7.1E+03 | 8.5E+03 | 7.1E+03 | 6.9E+03 | 1.2E+04 | 6.9E+03 | 6.4E+01 | 8.5E+01 | 7.6E+03 | 9.5E+01 | 6.9E+03 | 6.9E+03 | 7.0E+03 | 7.2E+03 | 7.2E+03 |
| Total (tons/yr) | 3.8E+00 | 3.5E+00 | 4.2E+00 | 3.5E+00 | 3.5E+00 | 5.8E+00 | 3.5E+00 | 3.2E-02 | 4.2E-02 | 3.8E+00 | 4.7E-02 | 3.5E+00 | 3.5E+00 | 3.5E+00 | 3.6E+00 | 3.6E+00 |

Section 1 **Introduction**

1.0 Installations & Emissions Inventory Background

Beale Air Force Base (AFB) is located in the northern portion of the state of California. The base is located approximately 45 miles northeast of the city of Sacramento. Beale AFB is located on 15,643 acres in Yuba County.

Beale AFB is currently under the command of Headquarters Air Combat Command (ACC) based at Langley AFB, Virginia. It is the home of the 9th Reconnaissance Wing (RW) and the 940th Air Refueling Wing (ARW) of the United States Air Force (USAF). The mission of Beale AFB is to maintain manpower, facility, and equipment infrastructure that is ready and capable of supporting tactical and strategic peacetime, contingency, and wartime deployment aerial surveillance operations. Functional activities at Beale AFB include support of air base operations involving the U-2, KC-135E and T-38. Other activities that the base supports are transient aircraft, periodic exercises, training, communications, ordnance, supplies, fuels, family housing, public works, recreation, and exchanges.

This inventory was accomplished during May 2005 for calendar year (CY) 2004 emissions. The purpose of the inventory was to provide Beale AFB with a mobile source air emissions inventory (AEI) to meet the requirements of Air Force Instruction (AFI) 32-7040, *Air Quality Compliance*, which directs installations to “Prepare and periodically update a comprehensive base air emissions inventory.”

Beale AFB is located in a county that is currently designated as a maintenance area for ozone. Air quality for the other criteria pollutants (Nitrogen Dioxide (NO₂), Carbon Monoxide (CO), Particulate Matter with an aerodynamic diameter \leq 10 microns (PM-10), Sulfur Oxides (SO_x), Volatile Organic Compounds (VOC), and lead (Pb)) are either better than the National Ambient Air Quality Standards (NAAQS) or cannot be classified due to lack of ambient monitoring data.

1.1 Mobile Emissions Sources

The mobile sources inventoried at Beale AFB include movements of aircraft based at Beale as well as transient aircraft (aircraft sorties), aerospace ground support equipment (AGE), government owned vehicles (GOVs), privately owned vehicles (POVs), and Non-road vehicles/Non-vehicular equipment.

Criteria and hazardous air pollutant emissions have been calculated for these sources. Typically, when comparing the mobile source emissions to stationary source emissions, the mobile emissions are significantly higher than stationary emissions. This is primarily due to the number and type of sources that are considered mobile. Mobile sources combust fuel and therefore emit significant quantities of nitrogen oxides (NO_x), CO and PM-10. Emissions from mobile sources are not presently regulated unless a base is

located in a non-attainment area and if proposed new emission increases are considered regionally significant, or exceed specified de minimis rates as defined under the Clean Air Act Amendments and conformity regulations. If the emission increases are deemed regionally significant a base may either have to install controls on existing equipment or purchase emission credits from either the state or private industry.

1.1.1 Aircraft Operations

During the 2004 there were 34,387 aircraft movements from aircraft based at Beale AFB. Aircraft sorties are aircraft landings and takeoffs (LTO), aircraft touch and goes (TGO), aircraft low fly bys (LFB), and aircraft low fly patterns (LFP). Transient Alert and the Aero Club reported 1,118 aircraft movements for non-based aircraft

An aircraft LTO is defined as the cycle time when an aircraft enters the atmospheric mixing zone and lands, taxi time in, idling time at the gate, taxi idle out to the takeoff runway, takeoff, and climb out through the atmospheric mixing zone. A TGO cycle time includes the time when the aircraft enters the atmospheric mixing zone and lands, immediately takes off, and climbs out through the atmospheric mixing zone. A LFB is similar to a TGO but less time is spent in the takeoff mode. A LFP is similar to a LFB; only the aircraft stays in approach mode for a specified period of time.

Emissions from aircraft sorties are based on the time the aircraft stays within the atmospheric mixing zone. The atmospheric mixing zone height is the ceiling height of the layer of the earth's atmosphere where chemical reactions of pollutants can ultimately affect ground level pollutant concentrations. The atmospheric mixing zone height is also known as the height of the inversion layer. According to the Air Force Combat Weather Service the average mixing zone height was 1153 feet above sea level.

Aircraft sortie data for 2004 was obtained from the 9th Reconnaissance Wing (9 RW/OG) for the U-2 and T-38 aircraft. During 2004 the 9 RW flew 2317 U-2 sorties and 2494 T-38 sorties. The 940th Air Refueling Wing (940 OSF/OSMP) provided sortie information on the KC-135E. During 2004, the 9 ARW flew 829 sorties at Beale AFB.

1.1.2 On-Wing Engine Tests

On-wing engine tests are considered mobile emissions due to the fact that the engines are mounted on the aircraft and not on a test stand. At Beale AFB these tests are conducted either on the flightline or the trim pad. The typical test lasts from 30 to 50 minutes. One or more power settings are tested and adjusted during each test. During CY 2004 there were 20 U-2, 80 T-38A, and 113 KC-135E engine tests. No records were maintained of any other aircraft on-wing engine tests.

1.1.3 Aerospace Ground Support Equipment

AGE consists of generators, air starters, light units, hydraulic power units, compressors, heaters, air conditioners, bomb lifts, and jacking units. AGE are powered by either

reciprocating internal combustion engines or turbines. The emissions from AGE equipment are based on the annual fuel usage. All AGE equipment at Beale AFB is fired on JP-8, diesel or gasoline. The 9th Maintenance Squadron (MXS/MXMGS) had 188 pieces of AGE. The 940 ARW had 63 pieces of AGE.

1.1.4 Government and Privately Owned Vehicles

GOV and POV emissions were also characterized. Emissions from GOVs were calculated on the number of miles driven by each vehicle type. This data was provided by the 9th Logistics Readiness Squadron (LRS/LGRVM) and the 9th Services Squadron (SVS/SVRA). POV emissions are based on vehicle counts at the four active gates and occupied housing units at Beale AFB. The total number of vehicles is then multiplied by an estimate of the number of the miles driven on base by each vehicle.

There are 343 on road government vehicles at Beale AFB which traveled a total of 1,682,886 miles during 2004. There are 5,998 privately owned vehicles at Beale which were estimated to travel 9.61 miles per day.

1.1.5 Non-road Vehicles/Non-vehicular Equipment

Non-road vehicles/Non-vehicular equipment consists of equipment not classified as GOVs, POVs, AGE equipment, or aircraft. Typically this class is composed of turf maintenance, construction, agricultural, or industrial equipment. Non-road vehicles/Non-vehicular equipment are fueled with either gasoline or diesel. Emissions for this type of fuel burning equipment are based on horsepower and operating time. Equipment surveys from 9th Civil Engineering Squadron (CES/CEOES), 9th SVS/SVRG and the 9 LRS/LGRVM indicate that there are 132 pieces of non-road vehicles/non-vehicular equipment at Beale AFB.

1.2 Results and Recommendations

Criteria and hazardous air pollutant (HAP) emissions were calculated for each mobile source. The 2004 inventory was the first comprehensive mobile source emissions inventory prepared for operations at Beale AFB. Some operational data, used for calculating mobile source emissions, was not required to be tracked. However, to improve the accuracy of future inventories, Air Force Institute for Operational Health (AFIOH) suggests the following recommendations:

- Improve record keeping of LTO cycles. If the LTO cycle involves LFBs, TGOs, or LFPs those should also be tracked.
- Maintain records for on-wing engine tests for all aircraft, as well as trimpad testing.
- Maintain fuel usage and hours operated for each type of AGE.

Section 2

Aircraft Flightline Operations

2.0 General

Base specific LTO, TGO, LFB, and LFP mode times were provided by the 9 RW and the 940 ARW. These mode times were used to calculate emissions for aircraft stationed at Beale AFB. Actual landing and takeoff scenarios were not available for transient aircraft, therefore, United States Environmental Protection Agency (USEPA) default LTO times were used to calculate emissions for aircraft not based at Beale AFB. Transient aircraft data was provided by Transient Alert and the Aero Club.

Tables 2-1, 2-2 and 2-3 provide information on the aircraft, aircraft movements, and criteria and hazardous air pollutant emissions stationed at Beale AFB during 2004. Tables 2-4, 2-5, 2-6, and 2-7 provide similar information on transient aircraft. Individual aircraft emission calculation sheets can be found in Appendixes A and B.

2.1 Emission Calculations

Two separate methodologies are used to calculate actual emissions from aircraft movements and auxiliary power units. Criteria and HAP emissions from aircraft movements were calculated using the following equation:

$$E_{pol} = [(EF_{Approach} * T_{Mode} / 60) + (EF_{Taxi\ Idle-in} * T_{Mode} / 60) + (EF_{Taxi\ Idle-out} * T_{Mode} / 60) + (EF_{Takeoff} * T_{Mode} / 60) + (EF_{Climb\ out} * T_{Mode} / 60)] * E_{Number} * N_{Cycles}$$

Where,

E_{pol} = Emissions of a particular pollutant (lb/yr)

EF = Emission factor for a pollutant at a specific power setting (lb/hr)

60 = Factor for converting minutes to hours

T_{Mode} = Time-in-mode (min)

E_{Number} = Number of engines on aircraft

N_{Cycles} = Number of LTOs, TGOs, LFBs, or LFPs

Auxiliary power unit emissions were calculated using the following formula:

$$E_{pol} = EF * N_{Cycles} * E_{APUs} * T_{Cycle}$$

Where,

E_{pol} = Emissions of a particular pollutant (lb/yr)

EF = Emission factor for a pollutant at a specific power setting (lb/hr)

And

- T_{Cycle} = Operating time per LTO (hours)
 E_{APUs} = Number of APUs on aircraft
 N_{Cycles} = Number of LTOs per year

Sample Calculations

The following is an example calculation for determining LTO NO_x emissions for U-2 aircraft:

NO_x emission factors: Idle in/out: 4.72 lb/hr
Approach: 41.84 lb/hr
Takeoff: 360.58 lb/hr
Climbout: 114.36 lb/hr

LTO Time in Modes: Approach: 2 min
Taxi/Idle-in: 15 min
Taxi/Idle-out: 12 min
Takeoff: 1 min
Climbout: 0 min

Number of LTOs in CY 2004: 2317

Number of engines on aircraft: 1

$$E_{\text{pol}} = [(EF_{\text{Approach}} * T_{\text{Mode}} / 60) + (EF_{\text{Taxi Idle-in}} * T_{\text{Mode}} / 60) + (EF_{\text{Taxi Idle-out}} * T_{\text{Mode}} / 60) + (EF_{\text{Takeoff}} * T_{\text{Mode}} / 60) + (EF_{\text{Climb out}} * T_{\text{Mode}} / 60)] * E_{\text{Number}} * N_{\text{Cycles}}$$

$$E_{\text{NOx}} = [(41.84 \text{ lb/hr} * 2 \text{ min} / 60) + (4.72 \text{ lb/hr} * 15 \text{ min} / 60) + (4.72 \text{ lb/hr} * 12 \text{ min} / 60) + (360.58 \text{ lb/hr} * 1 \text{ min} / 60) + (114.36 \text{ lb/hr} * 0 \text{ min} / 60)] * 1 \text{ Engine} * 2317 \text{ LTOs}$$

$$\mathbf{E_{\text{NOx}} = 22,077 \text{ lb/yr}}$$

The following is a sample calculation the APU NO_x emissions for the LTO of a KC-135E.

NO_x emission factor: 1.51 lb/hr

Operating time per LTO: 1.5 hr

Number of APUs: 1

Number of LTOs: 829

$$E_{\text{pol}} = EF * N_{\text{Cycles}} * E_{\text{APUs}} * T_{\text{Cycle}}$$
$$E_{\text{NOx}} = 1.51 \text{ lb/hr} * 829 \text{ LTO} * 1 * 1.5 \text{ hr/LTO}$$
$$\mathbf{E_{\text{NOx}} = 1877.69 \text{ lb/yr}}$$

2.2 References

1. U.S. Air Force - *Air Emissions Inventory Guidance for Mobile Sources at Air Force Installations* (Revised December 2003) (Section 3), IERA-RS-BR-SR-2001-0010, January 2002, AFIERA/RSEQ, Brooks AFB, Texas.
2. U.S. Air Force - *Aircraft/Auxiliary Power Units/Aerospace Ground Support Equipment Emission Factors*, IERA-RS-BR-SR-2003-0002, October 2002, AFIERA/RSEQ, Brooks AFB, Texas.

Table 2-1 Aircraft/Engines/APUs Emission Factor Cross Reference for Based Aircraft

| Aircraft Name | Aircraft Engine | Number/Type of Engines | No. and Type Auxiliary Power Unit(s) | Engine Used for Criteria Emission Factors | Engine Used for HAP Emission Factors | APU Used for Criteria/HAP Emission Factors |
|---------------|-----------------|------------------------|--------------------------------------|---|--------------------------------------|--|
| KC-135E | TF33-P-102 | 4 Turbofan | 1 GTCP85-180 | TF33-P-102 | TF33-P-102 | GTCP85-180 |
| T-38 | J85-GE-5 | 2 Augmented Turbojet | N/A | J85-GE-5 | J85-GE-5 | N/A |
| U-2 | F118-GE-100/101 | 1 Turbofan | N/A | F118-GE-100 | F118-GE-100 | N/A |

Note: Emission factors for engines and APUs come from reference 1 and/or 2.

Table 2-2 Aircraft Movement Scenarios for Based Aircraft

| Aircraft | Engine Number and Model | Movement Type | Number Per Year | Movement Scenarios | | | | |
|----------|-------------------------|---------------|-----------------|------------------------|-------------------------|--------------------|---------------------|-------------------|
| | | | | Taxi/Idle-in (Minutes) | Taxi/Idle-out (Minutes) | Approach (Minutes) | Climb-Out (Minutes) | Takeoff (Minutes) |
| KC-135E | TF33-P-102 | LTO | 829 | 8 | 8 | 1.25 | 1 | 2 |
| | | TGO | 2487 | 0 | 0 | 1.25 | 1 | 2 |
| | | LFB | 829 | 0 | 0 | 1.25 | 1 | 0 |
| | | LFP | 829 | 0 | 0 | 0 | 2 | 0 |
| T-38 | J85-GE-5 | LTO | 2494 | 6 | 11 | 1 | 1 | 1 |
| | | TGO | 7482 | 0 | 0 | 1 | 1 | 1 |
| | | LFB | 748.2 | 0 | 0 | 1 | 1 | 1 |
| | | LFP | 0 | 0 | 0 | 0 | 0 | 0 |
| U-2 | F118-GE-100 /101 | LTO | 2317 | 15 | 12 | 2 | 0 | 1 |
| | | TGO | 9268 | 0 | 0 | 2 | 0 | 1 |
| | | LFB | 2317 | 0 | 0 | 2 | 0 | 1 |
| | | LFP | 6951 | 0 | 0 | 0 | 2 | 0 |

Tale 2-3 Summary of Pollutant Emissions for Based Aircraft

| Aircraft Type | Criteria Pollutants | | | | | HAP Pollutants | | | | | | | | | |
|------------------------|----------------------------|-------------------|-------------------|-----------------------------|----------------------------|-------------------------|---------------------|--------------------|-------------------------|-------------------------|-----------------------------------|------------------------|--------------------|--------------------|-------------------|
| | NO _x (lb/yr) | CO (lb/yr) | VOC (lb/yr) | PM ₁₀ (lb/yr) | SO _x (lb/yr) | Acetaldehyde (lb/yr) | Acrolein (lb/yr) | Benzene (lb/yr) | Ethylbenzene (lb/yr) | Formaldehyde (lb/yr) | Methyl Ethyl Ketone (lb/yr) | Naphthalene (lb/yr) | Styrene (lb/yr) | Toluene (lb/yr) | Xylene (lb/yr) |
| C-135 | 83,053.50 | 137,323.99 | 107,898.36 | 39,065.80 | 23,926.09 | 0.71 | 0.10 | 27.34 | 1.86 | 158.68 | 5.18 | 2.73 | 1.48 | 26.37 | 8.98 |
| T-38 | 13,603.44 | 268,717.11 | 23,620.59 | 17,315.09 | 9,547.20 | 208.26 | 170.52 | 35.43 | 7.87 | 2,183.07 | 74.62 | 81.62 | 8.66 | 34.98 | 47.87 |
| U-2 | 134,353.56 | 30,408.31 | 2,197.67 | 16,000.04 | 13,772.02 | 8.51 | 0.00 | 33.80 | 2.29 | 260.00 | 0.00 | 0.00 | 2.59 | 15.00 | 10.80 |
| Total (lb/yr) | 231,010.50 | 436,449.41 | 133,716.62 | 72,380.93 | 47,245.31 | 217.47 | 170.62 | 96.57 | 12.02 | 2,601.75 | 79.80 | 84.35 | 12.73 | 76.36 | 67.65 |
| Total (tons/yr) | 115.51 | 218.22 | 66.86 | 36.19 | 23.62 | 0.11 | 0.09 | 0.05 | 0.01 | 1.30 | 0.04 | 0.04 | 0.01 | 0.04 | 0.03 |

Table 2-4 Aircraft/Engines/APUs Emission Factor Cross Reference for Non-Based Aircraft

| Aircraft Name | Aircraft Engine | Number/Type of Engines | No. and Type Auxiliary Power Unit(s) | Engine Used for Criteria Emission Factors | Engine Used for HAP Emission Factors | APU Used for Criteria/HAP Emission Factors |
|-----------------------|-----------------|------------------------|--------------------------------------|---|--------------------------------------|--|
| A-10 | TF34-GE-100 | 2 Turbofan | 1 GTCP36-50 | TF34-GE-100 | TF34-GE-100 | Footnote ¹ |
| B-707 | JT3D-3 | 4 Turbofan | 1 GTCP 85 | JT3D-3 | TF33-P-102 | GTCP 85 |
| B-747 | CF6-80 | 4 Turbofan | 1 GTCP660 | CF6-80 | TF39-GE-1A/1C | GTCP 660 |
| C-5A | TF39-GE-1A/-1C | 4 Turbofan | 2 GTCP165-1B | TF39-GE-1A/1C | TF39-GE-1A/1C | GTCP165-1 |
| C-9 | JT-8D-11A | 2 Turbofan | 1 GTCP85-98(D) | JT-8D-11A | TF33-P-102 | Footnote ¹ |
| C-12F | PT6A-42 | 2 Turboprop | N/A | PT6A-42 | PT6A-68 | N/A |
| C-17 | F117-PW-100 | 4 Turbofan | 1 331-259(G) | F117-PW-100 | F117-PW-100 | GTCP 331-250 |
| C-21 | TFE731-2/-2A | 2 Turbofan | N/A | TFE731-2/-2A | TF34-GE-100 | N/A |
| C-37 | BR700-715 | 2 Turbofan | 1 GTCP 36 | BR700-715 | F108-GE-100 | GTCP 36 |
| C-130 | T56-A-15 | 4 Turboprop | 1 GTCP85-180 | T56-A-15 | T56-AII | GTCP 85-180 |
| C-141 | TF33-P-/7-7A | 4 Turbofan | 1 GTCP85-106 | TF33-P-/7-7A | TF33-P-/7-7A | Footnote ¹ |
| E-4B | F103-GE-100 | 4 Turbofan | 1 GTCP660 | CF6-80 | TF30-GE-1A/1C | GTCP 660 |
| F-15 | F100-PW-229 | 2 Augmented Turbofan | 1 Jet Starter T62-T-40-8 | F100-PW-229 | F100 All | AM32A-60A ² |
| F-16 | F110-GE-100 | 1 Augmented Turbofan | 1 T62-T-40-8 | F110-GE-100 | F110 Series | T62T27 |
| KC-10 | F103-GE-101 | 3 Turbofan | 1 TSCP700-4B | F103-GE-101 | TF39-GE-1A/1C | TSCP 700-4B |
| KC-135 | F108-CF-100 | 4 Turbofan | N/A | F108-CF-100 | F108-CF-100 | N/A |
| MH-60S | T700-GE-700 | 2 Turboshaft | 1 T62T40-1 | T700-GE-700 | T700-GE-700 | T62T27 |
| T-1A | JT15D-5B | 2 Turbofan | N/A | JT15D-5B | F108-GE-100 | N/A |
| T-38 | J85-GE-5 | 2 Augmented Turbojet | N/A | J85-GE-5 | J85-GE-5 | N/A |
| Generic 2 Engine Prop | IO360D | 2 Prop | N/A | IO360D | N/A | N/A |

Note: Emission factors for engines and APUs come from reference 1 and/or 2.

¹ Average Emission rate for all other APUs

² Jet starter emission factor

Table 2-5 Default Time-in-Mode for Various Aircraft Categories¹

| Aircraft Type | Typical Duration by Mode (minutes) | | | | | |
|---|------------------------------------|----------|----------|----------|--------------|-------|
| | Taxi/ Idle-out | Takeoff | Climbout | Approach | Taxi/Idle-in | Total |
| Civilian Aircraft² | | | | | | |
| Commercial Carrier | | | | | | |
| Jumbo, long and medium range jet - A-300, A-310, A-320, A-330, A-340, AN-124, B-707, B-747, B767, B-777, DC-8, DC-9, DC-10, L-1011, MD-11 | 19.0 | 0.7 | 2.2 | 4.0 | 7.0 | 32.9 |
| Turboprop - C-2, C-12, C-23, L-100 | 19.0 | 0.5 | 2.5 | 4.5 | 7.0 | 33.5 |
| Transport-piston - 4 Eng Prop | 6.5 | 0.6 | 5.0 | 4.6 | 6.5 | 23.2 |
| General Aviation | | | | | | |
| Business Jet - C-21, C-22, LJ/UC -35, Generic 2 Eng Jet | 6.5 | 0.4 | 0.1 | 1.6 | 6.5 | 15.5 |
| Turboprop | 19.0 | Aircraft | 2.5 | 4.5 | 7.0 | 33.5 |
| Piston Generic 1 Eng, 2 Eng Prop | 12.0 | 0.3 | 5.0 | 6.0 | 4.0 | 27.3 |
| Helicopter | 3.5 | - | 6.5 | 6.5 | 3.5 | 20.0 |
| Military Aircraft³ | | | | | | |
| Combat⁴ | | | | | | |
| USAF- A-10, F-15, F16 | 18.5 | 0.4 | 0.8 | 3.5 | 11.3 | 34.5 |
| USN ^e F-14, F-18 | 6.5 | 0.4 | 0.5 | 1.6 | 6.5 | 15.5 |
| Trainer-Turbine | | | | | | |
| USAF T-37, T-38, T-1A | 12.8 | 0.4 | 0.9 | 3.8 | 6.4 | 24.3 |
| Transport-Turbine⁵ | | | | | | |
| USAF general C-22, C-32A, C-40, C-5A, C-9, C-141, E-3, E-4B, E-3, KC-10, C-135, C-130, CL-60, E-2 | 9.2 | 0.4 | 1.2 | 5.1 | 6.7 | 22.6 |
| USN - EA/A-6, P-3, S-3 | 19.0 | 0.5 | 2.5 | 4.5 | 7.0 | 33.5 |
| USAF B-1B, B-52 | 32.8 | 0.7 | 1.6 | 5.2 | 14.9 | 55.2 |
| Military-Piston | 6.5 | 0.6 | 5.0 | 4.6 | 6.5 | 23.2 |
| Military-Helicopter -CH-3, CH-53, UH-3H, MH-60S, UH-60H, UH-3 | 8.0 | - | 6.8 | 6.8 | 7.0 | 28.6 |

¹ Source of data is the EPA document "Compilation of Air Pollutant Emission Factors, Volume II: Mobile Sources" (AP-42, Volume II)

² Civil aircraft data is for large congested metropolitan airports.

³ USAF = U.S. Air Force; USN = U.S. Navy

⁴ Fighters and attack aircraft only.

⁵ Includes all turbine aircraft not specified elsewhere (i.e., transport, cargo, observation, patrol, antisubmarine, early warning, and utility).

Table 2-6 Aircraft Movements for Non-Based Aircraft

| Aircraft Model | Aero Club LTOs | Transient Alert LTOs | Total LTO's |
|-----------------------|----------------|----------------------|-------------|
| A-10 | 0 | 4 | 4 |
| B-707 | 0 | 1 | 1 |
| B-747 | 0 | 4 | 4 |
| C-5A | 0 | 5 | 5 |
| C-9 | 0 | 3 | 3 |
| C-12F | 0 | 12 | 12 |
| C-17 | 0 | 2 | 2 |
| C-21 | 0 | 13 | 13 |
| C-37 (Gulfstream V) | 0 | 1 | 1 |
| C-130 | 0 | 1 | 1 |
| C-141 | 0 | 1 | 1 |
| E-4B | 0 | 6 | 6 |
| F-15 | 0 | 3 | 3 |
| F-16 | 0 | 6 | 6 |
| KC-10 | 0 | 4 | 4 |
| KC-135 | 0 | 3 | 3 |
| MH-60S | 0 | 3 | 3 |
| T-1A | 0 | 1 | 1 |
| T-38 | 0 | 24 | 24 |
| Generic 2 Engine Prop | 1020 | 1 | 1021 |

Table 2-7 Summary of Pollutant Emissions for Transient Aircraft

| Aircraft Type | Criteria Pollutants | | | | | HAP Pollutants | | | | | | | | | |
|------------------------|----------------------------|------------------|-----------------|-----------------------------|----------------------------|-------------------------|---------------------|--------------------|-------------------------|-------------------------|-----------------------------------|------------------------|--------------------|--------------------|-------------------|
| | NO _x (lb/yr) | CO (lb/yr) | VOC (lb/yr) | PM ₁₀ (lb/yr) | SO _x (lb/yr) | Acetaldehyde (lb/yr) | Acrolein (lb/yr) | Benzene (lb/yr) | Ethylbenzene (lb/yr) | Formaldehyde (lb/yr) | Methyl Ethyl Ketone (lb/yr) | Naphthalene (lb/yr) | Styrene (lb/yr) | Toluene (lb/yr) | Xylene (lb/yr) |
| A-10 | 6.34 | 165.56 | 37.62 | 18.37 | 4.94 | 2.4E-01 | 1.2E-01 | 5.4E-01 | 5.0E-02 | 2.3E+00 | ND | 8.4E-02 | 8.4E-02 | 2.2E-01 | 1.5E-01 |
| B-707 | 28.02 | 233.90 | 201.54 | 20.79 | 9.86 | 0.02 | 0.00 | 1.33 | 0.16 | 0.00 | ND | 0.40 | 0.20 | 0.50 | 0.37 |
| B-747 | 132.10 | 446.13 | 99.20 | 141.80 | 54.44 | 1.78 | 1.70 | 2.99 | 0.18 | 11.86 | 0.31 | 0.80 | 0.37 | 1.06 | 0.52 |
| C-5A | 917.44 | 1,673.19 | 395.99 | 105.00 | 189.52 | 5.02 | 4.83 | 9.19 | 0.52 | 32.86 | 0.89 | 2.36 | 1.09 | 3.41 | 1.51 |
| C-9 | 46.97 | 218.85 | 51.41 | 24.76 | 27.17 | 0.08 | ND | 4.12 | 0.48 | 6.21 | 0.01 | 1.21 | 0.61 | 1.56 | 1.13 |
| C-12F | 9.52 | 196.54 | 88.89 | 6.16 | 5.15 | 0.44 | 1.12 | 0.09 | 0.07 | 9.28 | 1.11 | 0.02 | 0.08 | 0.27 | 0.08 |
| C-17 | 184.55 | 173.99 | 16.64 | 98.96 | 27.95 | 0.08 | 0.00 | 0.16 | 0.02 | 1.71 | ND | 0.02 | 0.01 | 0.06 | 0.03 |
| C-21 | 13.74 | 62.10 | 10.50 | 4.61 | 3.86 | ND | ND | 0.02 | 0.00 | 0.12 | 0.01 | 0.00 | 0.00 | 0.01 | 0.00 |
| C-37 | 6.41 | 17.57 | 0.07 | 2.88 | 1.42 | 0.00 | ND | 0.01 | 0.00 | 0.04 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 |
| C-130 | 17.53 | 20.13 | 3.23 | 5.90 | 3.77 | 0.01 | 0.00 | 0.01 | 0.00 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| C-141 | 26.01 | 483.61 | 445.52 | 33.75 | 15.82 | 0.01 | 0.00 | 1.79 | 0.67 | 7.92 | ND | 1.25 | 0.81 | 1.26 | 1.55 |
| E-4B | 72.35 | 348.24 | 76.01 | 67.96 | 57.91 | 3.04 | 2.92 | 5.11 | 0.30 | 20.27 | 0.53 | 1.38 | 72.35 | 1.83 | 0.85 |
| F-15 | 79.30 | 99.02 | 15.34 | 11.44 | 11.29 | 0.82 | 0.38 | 0.33 | 0.02 | 3.33 | 0.09 | 0.21 | 0.02 | 0.07 | 0.15 |
| F-16 | 58.62 | 199.94 | 58.53 | 34.80 | 15.32 | 0.03 | 0.03 | 0.22 | 0.04 | 0.35 | 0.00 | 0.07 | 0.02 | 0.13 | 0.07 |
| KC-10 | 452.69 | 592.44 | 207.17 | 40.24 | 61.48 | 1.92 | 1.86 | 3.47 | 0.20 | 12.65 | 0.34 | 0.90 | 0.42 | 1.28 | 0.58 |
| KC-135 | 99.41 | 315.08 | 10.16 | 105.12 | 42.12 | ND | ND | 0.16 | 0.01 | 1.09 | 0.06 | 0.03 | 0.02 | 0.12 | 0.03 |
| MH-60 | 11.41 | 51.48 | 13.07 | 1.67 | 2.25 | 0.02 | 0.01 | 0.06 | 0.00 | 0.32 | ND | 0.01 | 0.01 | 0.02 | 0.01 |
| T-1A | 0.63 | 11.30 | 7.85 | 0.64 | 0.30 | ND | ND | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| T-38 | 31.23 | 1,785.22 | 158.74 | 95.47 | 30.99 | 2.03 | 1.74 | 0.12 | 0.07 | 19.93 | 0.69 | 0.71 | 0.07 | 0.29 | 0.39 |
| Generic 2 Eng Prop | 435.15 | 46,175.75 | 3,124.94 | 2,102.58 | 312.09 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Total (lb/yr) | 2,629.43 | 53,270.03 | 5,022.43 | 2,922.90 | 877.62 | 15.55 | 14.71 | 29.74 | 2.80 | 130.35 | 4.05 | 9.45 | 76.17 | 12.09 | 7.44 |
| Total (tons/yr) | 1.31 | 26.64 | 2.51 | 1.46 | 0.44 | 7.8E-03 | 7.4E-03 | 1.0E+00 | 1.4E-03 | 6.5E-02 | 2.0E-03 | 4.7E-03 | 3.8E-02 | 6.0E-03 | 3.7E-03 |

Section 3

On-Wing Aircraft Engine Testing

3.0 General

At Beale AFB, aircraft engines are tested while mounted on the aircraft. On-wing engine testing is considered to be a mobile source. Testing of the U-2 (F118-GE-100/101), T38 (J85-GE-5), and the KC-135E (TF33-P-102) engines were conducted on the flightline or on the trim pad.

A typical test lasted approximately 35 to 50 minutes. One or more power settings are tested and adjusted during each test. Emissions from on-wing engine tests were based on the total number of test hours and the engine power settings tested.

Table 3-1 provides a summary of the on-wing engine tests at Beale AFB for CY 2004. On-wing engine test criteria pollutant and hazardous air pollutant emissions are provided in Table 3-2. Engine emissions calculation sheets can be found in Appendix C.

3.1 Emission Calculations

The following equation was used to calculate the emissions:

$$E_{\text{pol, set}} = EF * t/60 * N$$

Where,

- $E_{\text{pol, set}}$ = Emissions of a particular pollutant resulting from testing an aircraft engine at a specific power setting (lb/yr)
EF = Emission factor in pounds pollutant per hour (lb/hr)
t = Total annual time engine tested at a particular setting (min/test)
60 = Factor for converting minutes to hours
N = Number of tests per year (test/yr)

Sample Calculations

The following is an example calculation for determining NO_x emissions from the U-2 (F118-GE-100/101) trim pad engine emission testing at a particular setting and test duration:

- NO_x emission factor (Idle): 4.72 lb/hr
Number of tests in CY 2004: 12 tests/yr
Test Duration: 20 min/test

$$E_{\text{NO}_x, \text{idle}} = EF * t/60 * N$$
$$E_{\text{NO}_x} = [(4.72 \text{ lb NO}_x/\text{hr} * (20 \text{ min/test})/(60 \text{ min/hr})) * 12 \text{ tests/yr}] = \mathbf{18.88 \text{ lb /yr}}$$

3.2 References

1. U.S. Air Force - *Air Emissions Inventory Guidance for Mobile Sources at Air Force Installations* (Revised December 2003) (Section 3), IERA-RS-BR-SR-2001-0010, January 2002, AFIERA/RSEQ, Brooks AFB, Texas.
2. U.S. Air Force - *Aircraft/Auxiliary Power Units/Aerospace Ground Support Equipment Emission Factors*, IERA-RS-BR-SR-2003-0002, October 2002, AFIERA/RSEQ, Brooks AFB, Texas.

Table 3-1 On-Wing Engine Tests

| Aircraft | Engine Number and Model | Organization | Number Per Year | Average Run Time Per Test (Minutes) | | | |
|----------|-------------------------|--------------|-----------------|-------------------------------------|--------------|----------|-------------|
| | | | | Idle | Intermediate | Military | Afterburner |
| U-2 | F118-GE-100 /101 | 9MXS/MXMP | 12 | 20 | 0 | 15 | 0 |
| T-38A | J85-GE-5M | 9 MOS | 80 | 6 | 0 | 4 | 2 |
| KC-135E | TF33-P-102 | 940 AMXS | 53 | 30 | 15 | 5 | 0 |
| KC-135E | TF33-P-102 | 940MXS/MXMP | 60 | 30 | 0 | 5 | 0 |

Table 3-2 Summary of Pollutant Emissions for On-Wing Engine Tests

| Aircraft Type | Criteria Pollutants | | | | | HAP Pollutants | | | | | | | | | |
|------------------------|----------------------------|-----------------|-----------------|-----------------------------|----------------------------|-------------------------|---------------------|--------------------|-------------------------|-------------------------|-----------------------------------|------------------------|--------------------|--------------------|-------------------|
| | NO _x (lb/yr) | CO (lb/yr) | VOC (lb/yr) | PM ₁₀ (lb/yr) | SO _x (lb/yr) | Acetaldehyde (lb/yr) | Acrolein (lb/yr) | Benzene (lb/yr) | Ethylbenzene (lb/yr) | Formaldehyde (lb/yr) | Methyl Ethyl Ketone (lb/yr) | Naphthalene (lb/yr) | Styrene (lb/yr) | Toluene (lb/yr) | Xylene (lb/yr) |
| KC-135E | 1,338.96 | 3,506.39 | 3,127.09 | 775.96 | 414.56 | ND | ND | 0.49 | 0.03 | 3.47 | 0.16 | 0.08 | 0.04 | 0.43 | 0.13 |
| KC-135E | 600.05 | 3,758.90 | 3,440.50 | 324.20 | 196.90 | ND | ND | 0.47 | 0.03 | 3.34 | 0.18 | 0.09 | 0.05 | 0.34 | 0.08 |
| T-38 | 154.16 | 1,858.00 | 151.20 | 84.85 | 79.42 | 1.04 | 0.90 | 0.27 | 0.04 | 11.16 | 0.35 | 0.46 | 0.04 | 0.18 | 0.42 |
| U-2 | 1,100.62 | 113.32 | 2.60 | 59.03 | 74.10 | 0.03 | ND | 0.13 | 0.01 | 1.00 | ND | ND | 0.01 | 0.06 | 0.03 |
| Total (lb/yr) | 3,193.79 | 9,236.61 | 6,721.39 | 1,244.05 | 764.97 | 1.08 | 0.90 | 1.36 | 0.10 | 18.98 | 0.69 | 0.64 | 0.14 | 1.00 | 0.65 |
| Total (tons/yr) | 1.60 | 4.62 | 3.36 | 0.62 | 0.38 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

Section 4

Aerospace Ground Support Equipment

4.0 General

AGE is mobile equipment that is used to support aircraft on the flightline at Beale AFB. The primary source of power for AGE is either reciprocating internal combustion engines or turbines. At Beale AFB, all AGE equipment is fired on either JP-8 or diesel, except for portable aircraft arresting barrier engines, which operate on gasoline. A summary of the AGE in use during CY 2004 is provided in Table 4-1.

4.1 Emission Calculations

Several emission calculation techniques are available for estimating AGE emissions. The choice of methods should be based on the available operating data. Each method is used with an emission factor that best fits the data. Methods used in this report are based on power available (e.g., rated horsepower), annual fuel usage, operating time, or combinations of these data. All HAP emissions are calculated on the basis of fuel consumption. Each calculation method equation is shown below with a sample calculation for each technique.

4.1.1. Fuel Usage Method

$$E_{pol} = EF * (FC / 1000)$$

Where,

- E_{pol} = Emissions of particular pollutant (lb/yr)
- EF = Emission Factor (lb/ 10^3 gal)
- FC = Fuel Consumption (gal/yr)
- 1000 = Factor for converting 10^3 to 1000 gallons

Sample Calculation

The following is an example of NO_x emissions for the A/M32A-95 turbine generator:

NO_x emission factor: 40.0 lb/ 10^3 gal

Fuel consumption CY2004 (total for all 26 units): 13,307 gal/yr

$$E_{NOx} = EF * (FC / 1000)$$

$$E_{NOx} = 40.0 \text{ lb}/10^3 \text{ gal} * (13,307 \text{ gal}/\text{yr}) / 1000 = \mathbf{532.3 \text{ lb}/\text{yr}}$$

4.1.2. Annual Operating Horsepower Method

$$E_{pol} = FC * 137,000 / 7,500 * EF / 453.59$$

Where,

E_{pol} = Emissions of particular pollutant (lb/yr)

FC = Fuel combustion (10^3 gal/yr)

137,000 = Conversion factor to converting gallons of diesel into Btu

7,500 = Conversion factor for converting Btu into hp-hr

EF = Emission Factor (g/hp-hr)

453.59 = Conversion factor to convert grams to pounds (g/lb)

Sample Calculation

The following is an example of NO_x emissions for the A/M32A-86D Generator Set:

NO_x emission factor: 18.7 g/hp-hr

Fuel Consumption (2004): 15,757 gal/yr

$E_{NO_x} = FC * 137,000(\text{Btu/gal}) / 7,500 (\text{Btu/hp-hr}) * EF / 453.59(\text{g/lb})$

$E_{NO_x} = 15,757 \text{ gal/yr} * 137,000 \text{ Btu/gal} / 7,500 \text{ Btu/hp-hr} * 18.7 \text{ g/hp-hr} / 453.59 \text{ g/lb}$

$E_{NO_x} = \mathbf{11,866.1 \text{ lb/yr}}$

Tables 4-2 and 4-3 provide emission factors and emissions of criteria pollutants for 2004. Table 4-4 and 4-5 provide emission factors and HAP emissions for 2004.

4.2 References

1. U.S. Air Force - *Air Emissions Inventory Guidance for Mobile Sources at Air Force Installations* (Revised December 2003) (Section 3), IERA-RS-BR-SR-2001-0010, January 2002, AFIERA/RSEQ, Brooks AFB, Texas.
2. U.S. Air Force - *Aircraft/Auxiliary Power Units/Aerospace Ground Support Equipment Emission Factors*, IERA-RS-BR-SR-2003-0002, October 2002, AFIERA/RSEQ, Brooks AFB, Texas.

Table 4-1 Summary of Aerospace Ground Support Equipment

| Equipment Type | Equipment Use | Engine Manufacturer | Engine Model No. | Fuel Type | Horsepower Rating (hp) | Typical Operating Load | Operating Time (hr/yr/Unit) | Fuel Flowrate (gal/yr) |
|--------------------------------|------------------|---------------------|------------------|-----------|------------------------|------------------------|-----------------------------|------------------------|
| 9 MXS/MXMGS | | | | | | | | |
| 26 - A/M32A-95 Turbine Gen. | Aircraft Support | Garret | GTC85-180C | JP-8 | 100 BHP | 150+5 LBS/MIN | N/A | 13,307 |
| 30 - A/M32-86 Diesel Gen. | Aircraft Support | Detroit Diesel | 4-71N | Diesel | 148 | 110.4 KW | N/A | 15,757 |
| 7 - MJ1-1 Hyd Test Stand | Aircraft Support | Detroit Diesel | 3-53 N | Diesel | 97 | N/A | N/A | 1509 |
| 42 - Fl-1D Lightall | Aircraft Support | Kubota | D905 - EBG1 | Diesel | 10.5 HP@1800 RPM | N/A | N/A | 2646.6 |
| 13 - New Generator Heater | Aircraft Support | Polytherm | AC1 | JP-8 | 6 | N/A | N/A | 2000 |
| 11 - MA-3D Air Conditioner | Aircraft Support | John Deere | 4039TF | Diesel | 102 | N/A | N/A | 3770.4 |
| 59 - Other Miscellaneous AGE | Aircraft Support | N/A | N/A | Diesel | 6.5 to 272 | N/A | N/A | 870 |
| 940 MXS/MXMG | | | | | | | | |
| 12 - A/M32A-86D Generator | Aircraft Support | Detroit Diesel | 4-71N | Diesel | 148 | 100 amp | 6 hr daily | 3105.7 |
| 8 - A/M32A-95, Air Start Carts | Aircraft Support | Libby | GTCP-180C | JP-8 | 100 | 100 bhp | 2hr daily | 1221.6 |
| 5 - MA-3D, Air Conditioner | Aircraft Support | John Deere | 4038TF-150 | Diesel | 100 | 100 bhp | 150 h/yr | 884 |
| 2 - MJ1-1 Hydraulic Test Stand | Aircraft Support | Detroit Diesel | R634057N | Diesel | 100 | 100 bhp | 100 hr/yr | 142.18 |
| 2 - MC-7 Air Compressor | Aircraft Support | Jon Deere | 3164D | Diesel | 58 | 58 bhp | 250 hr/yr | 771.7 |
| 5 - MC-2A Air Compressor | Aircraft Support | Ingersol Rand | | Diesel | 48 | 48 bhp | 200 hr/yr | 841.9 |
| 14 - NGH Heater | Aircraft Support | Yanmar | | Diesel | 46 | 46 bhp | 50 hr/yr | 589.3 |
| 2 - AFM/27M-1 Jacking Manifold | Aircraft Support | Hatz Diesel | D9409 | Diesel | 44 | 44 bhp | 75 hr/yr | 126.3 |
| 13 - NF-2D Light Cart | Aircraft Support | Kubota | D905-E | Diesel | 38 | 38 bhp | 600 hr/yr | 2261.9 |

Table 4-2 Aerospace Ground Support Equipment Emission Factors

| Equipment Type | Engine Manufacturer | Engine Model No. | Horsepower | Emission Factors | | | | | | | | |
|--------------------------------|---------------------|------------------|------------------|------------------|---|-----------------|--------------------------------|------------------|---------------------------------|-------------------------------|--|---|
| | | | | NOx (g/hp*hr) | NO _x (lb/10 ³ gal) | CO (g/hp*hr) | CO (lb/10 ³ gal) | VOC (g/hp*hr) | VOC (lb/10 ³ gal) | PM ₁₀ (g/hp*hr) | PM ₁₀ (lb/10 ³ gal) | SO _x (lb/10 ³ gal) |
| 9MXS/MXMG | | | | | | | | | | | | |
| 26 - A/M32A-95 Turbine Gen. | Garret | GTC85-180C | 100 BHP | N/A | 40.00 | N/A | 160.00 | N/A | 2.00 | N/A | 3.00 | 14.00 |
| 30 - A/M32-86 Diesel Gen. | Detroit Diesel | 4-71N | 148 | 18.70 | N/A | 1.40 | N/A | 0.90 | N/A | 0.28 | N/A | 21.00 |
| 7 - MJ1-1 Hyd Test Stand | Detroit Diesel | 3-53 N | 97 | 3.54 | N/A | 0.20 | N/A | 0.12 | N/A | 0.00 | N/A | 21.00 |
| 42 - Fl-1D Lightall | Kubota | D905 - EBG1 | 10.5 HP@1800 RPM | N/A | 8.36 | N/A | 6.17 | N/A | 0.67 | N/A | 0.77 | 21.00 |
| 13 - New Generator Heater | Polytherm | AC1 | 6 | 11.00 | N/A | 12.60 | N/A | 6.97 | N/A | 0.00 | N/A | 14.00 |
| - MA-3D Air Conditioner | John Deere | 4039TF | 102 | 2.64 | N/A | N/A | N/A | 1.17 | N/A | 0.26 | N/A | 21.00 |
| 59 - Other Miscellaneous AGE | N/A | N/A | 6.5 to 272 | N/A | 604.00 | N/A | 130.00 | N/A | 2.50 | N/A | 2.20 | 21.00 |
| 940 MXS/MXMG | | | | | | | | | | | | |
| 12 - A/M32A-86D Generator | Detroit Diesel | 4-71N | 148 | 18.70 | N/A | N/A | N/A | 0.90 | N/A | 0.28 | N/A | 21.00 |
| 8 - A/M32A-95, Air Start Carts | Libby | GTCP-180C | 100 | N/A | 40.00 | N/A | 160.00 | N/A | 2.00 | N/A | 3.00 | 14.00 |
| 5 - MA-3D, Air Conditioner | John Deere | 4038TF-150 | 100 | 2.64 | N/A | 0.24 | N/A | 1.17 | N/A | 0.26 | N/A | 21.00 |
| 2 - MJ1-1 Hydraulic Test Stand | Detroit Diesel | R634057N | 100 | 3.54 | N/A | 0.20 | N/A | 0.12 | N/A | 0.00 | N/A | 21.00 |
| 2 - MC-7 Air Compressor | Jon Deere | 3164D | 58 | 11.21 | N/A | 5.60 | N/A | 0.50 | N/A | 0.00 | N/A | 21.00 |
| 5 - MC-2A Air Compressor | Ingersol Rand | N/A | 48 | N/A | 604.00 | N/A | 130.00 | N/A | 2.50 | N/A | 2.20 | 21.00 |
| 14 - NGH Heater | Yanmar | N/A | 46 | N/A | 604.00 | N/A | 130.00 | N/A | 2.50 | N/A | 2.20 | 21.00 |
| 2 - AFM/27M-1 Jacking Manifold | Hatz Diesel | D9409 | 44 | N/A | 604.00 | N/A | 130.00 | N/A | 2.50 | N/A | 2.20 | 21.00 |
| 13 - NF-2D Light Cart | Kubota | D905-E | 38 | 7.80 | N/A | 6.00 | N/A | 0.00 | N/A | 7.50 | N/A | 21.00 |

Table 4-3 Aerospace Ground Support Equipment Criteria Pollutant Emissions

| Equipment Type | Estimated Fuel Usage (gal/yr/Unit) | NOx (lb/yr) | CO (lb/yr) | VOC (lb/yr) | PM10 (lb/yr) | SOx (lb/yr) |
|--------------------------------|------------------------------------|-----------------|-----------------|----------------|----------------|-------------|
| 9 MXS/MXMG | | | | | | |
| 26 - A/M32A-95 Turbine Gen. | 13,307.40 | 532.30 | 2,129.18 | 26.61 | 39.92 | 186.30 |
| 30 - A/M32-86 Diesel Gen. | 15,757 | 11,866.11 | 888.37 | 571.10 | 177.67 | 330.89 |
| 7 - MJ1-1 Hyd Test Stand | 1,509.00 | 215.12 | 12.15 | 7.29 | 0.00 | 31.69 |
| 42 - Fl-1D Lightall | 2,646.60 | 22.13 | 16.33 | 1.77 | 2.04 | 55.58 |
| 13 - New Generator Heater | 2,000.00 | 885.97 | 1,014.84 | 561.38 | 0.00 | 28.00 |
| 11 - MA-3D Air Conditioner | 3,770.40 | 400.85 | 36.44 | 177.65 | 39.48 | 79.18 |
| 59 - Other Miscellaneous AGE | 870.00 | 525.48 | 113.10 | 2.18 | 1.91 | 18.27 |
| Total (lb/yr) | 14,447.96 | 4,210.42 | 1,347.99 | 261.03 | 729.91 | |
| 940 MXSMXMG | | | | | | |
| 12 - A/M32A-86D Generator | 3,105.70 | 2,338.82 | 175.10 | 112.56 | 35.02 | 65.22 |
| 8 - A/M32A-95, Air Start Carts | 1,221.60 | 48.86 | 195.46 | 2.44 | 3.66 | 17.10 |
| 5 - MA-3D, Air Conditioner | 884.00 | 93.98 | 8.54 | 41.65 | 9.26 | 18.56 |
| 2 - MJ1-1 Hydraulic Test Stand | 142.18 | 20.27 | 1.15 | 0.69 | 0.00 | 2.99 |
| 2 - MC-7 Air Compressor | 771.70 | 348.38 | 174.03 | 15.54 | 0.00 | 16.21 |
| 5 - MC-2A Air Compressor | 841.90 | 508.51 | 109.45 | 2.10 | 1.85 | 17.68 |
| 14 - NGH Heater | 589.30 | 355.94 | 76.61 | 1.47 | 1.30 | 12.38 |
| 2 - AFM/27M-1 Jacking Mnaifold | 126.30 | 76.29 | 16.42 | 0.32 | 0.28 | 2.65 |
| 13 - NF-2D Light Cart | 2,261.90 | 710.50 | 546.54 | 0.00 | 683.17 | 47.50 |
| Total (lb/yr) | 33,397.5 | 9,724.1 | 2,872.7 | 1,256.6 | 1,660.1 | |
| Grand Total (lb/yr) | 47,845.4 | 13,934.5 | 4,220.7 | 1,517.6 | 2,390.0 | |
| Grand Total (ton/yr) | 23.92 | 6.97 | 2.11 | 0.76 | 1.20 | |

Table 4-4 HAP Emission Factors for Aerospace Ground Support Equipment

| EPA Emission Factors (lb/10 ³ gal) | Acetaldehyde | Acrolien | Benzene | 1-3 Butadiene | Formaldehyde | Naphthalene | PAH | Toluene | Xylenes |
|--|--------------|----------|----------|---------------|--------------|-------------|----------|----------|----------|
| Diesel Reciprocating Engine ¹ | 1.05E-01 | 1.30E-02 | 1.28E-01 | 5.00E-03 | 1.62E-01 | 1.20E-02 | 2.30E-02 | 5.60E-02 | 3.90E-02 |

| Air Force JP-8 Turbine Emission Factors (lb/10 ³ gal) | Acetaldehyde | Acrolien | Benzene | Ethylbenzene | Formaldehyde | Toluene | Xylenes |
|--|--------------|----------|----------|--------------|--------------|----------|----------|
| GTCP85-180 ² | 2.09E-03 | 3.00E-04 | 1.50E-02 | 8.78E-04 | 2.03E-02 | 4.36E-03 | 2.69E-03 |

¹Diesel HAP emission factors are used to calculate HAP emissions for units burning JP-8.

²The HAP emission factors for the GTCP85-180 turbine were used to calculate emissions for the A/M32A-60 and A/M32A-95 generators.

Table 4-5 HAP Emissions from Aerospace Ground Support Equipment

| Equipment Type | Total Fuel Usage (10^3 gal/yr) | Acetaldehyde | Acetilen | Benzene | 1,3 Butadiene | Ethylbenzene | Formaldehyde | Naphthalene | PAH | Toluene | Xylenes |
|--------------------------------|--------------------------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|---------|
| 9 MXS/MXMGS | | | | | | | | | | | |
| 26 - A/M32A-95 Turbine Gen. | 13.307 | 2.8E-02 | 8.3E-06 | 1.2E-02 | N/A | 6.7E-02 | 2.7E-01 | N/A | N/A | 5.8E-02 | 3.6E-02 |
| 30 - A/M32-86 Diesel Gen. | 15.757 | 1.7E+00 | 2.2E-02 | 2.0E+00 | 7.9E-02 | N/A | 2.6E+00 | 1.9E-01 | 3.6E-01 | 8.8E-01 | 6.1E-01 |
| 7 - MJ1-1 Hyd Test Stand | 1.509 | 1.6E-01 | 2.1E-03 | 1.9E-01 | 7.5E-03 | N/A | 2.4E-01 | 1.8E-02 | 3.5E-02 | 8.5E-02 | 5.9E-02 |
| 42 - Fl-1D Lightall | 2.646 | 2.8E-01 | 3.6E-03 | 3.4E-01 | 1.3E-02 | N/A | 4.3E-01 | 3.2E-02 | 6.1E-02 | 1.5E-01 | 1.0E-01 |
| 13 - New Generator Heater | 2.000 | 2.1E-01 | 2.7E-03 | 2.6E-01 | 1.0E-02 | N/A | 3.2E-01 | 2.4E-02 | 4.6E-02 | 1.1E-01 | 7.8E-02 |
| 11 - MA-3D Air Conditioner | 3.770 | 4.0E-01 | 5.1E-03 | 4.8E-01 | 1.9E-02 | N/A | 6.1E-01 | 4.5E-02 | 8.7E-02 | 2.1E-01 | 1.5E-01 |
| 59 - Other Miscellaneous AGE | 0.870 | 9.1E-02 | 1.2E-03 | 1.1E-01 | 4.4E-03 | N/A | 1.4E-01 | 1.0E-02 | 2.0E-02 | 4.9E-02 | 3.4E-02 |
| Total (lb/yr) | 2.8E+00 | 3.6E-02 | 3.4E+00 | 1.3E-01 | 6.7E-02 | 4.6E+00 | 3.2E-01 | 6.1E-01 | 1.5E+00 | 1.1E+00 | |
| 940 MXS/MXMGS | | | | | | | | | | | |
| 12 - A/M32A-86D Generator | 3.11 | 3.3E-01 | 4.2E-03 | 4.0E-01 | 1.6E-02 | N/A | 5.0E-01 | 3.7E-02 | 7.1E-02 | 1.7E-01 | 1.2E-01 |
| 8 - A/M32A-95, Air Start Carts | 1.22 | 2.6E-03 | 3.7E-04 | 1.8E-02 | N/A | 1.1E-03 | 2.5E-02 | N/A | N/A | 5.3E-03 | 3.3E-03 |
| 5 - MA-3D, Air Conditioner | 0.88 | 9.3E-02 | 1.2E-03 | 1.1E-01 | 4.4E-03 | N/A | 1.4E-01 | 1.1E-02 | 2.0E-02 | 5.0E-02 | 3.4E-02 |
| 2 - MJ1-1 Hydraulic Test Stand | 0.14 | 1.5E-02 | 1.9E-04 | 1.8E-02 | 7.1E-04 | N/A | 2.3E-02 | 1.7E-03 | 3.3E-03 | 8.0E-03 | 5.5E-03 |
| 2 - MC-7 Air Compressor | 0.77 | 8.1E-02 | 1.1E-03 | 9.9E-02 | 3.9E-03 | N/A | 1.3E-01 | 9.3E-03 | 1.8E-02 | 4.3E-02 | 3.0E-02 |
| 5 - MC-2A Air Compressor | 0.84 | 8.8E-02 | 1.1E-03 | 1.1E-01 | 4.2E-03 | N/A | 1.4E-01 | 1.0E-02 | 1.9E-02 | 4.7E-02 | 3.3E-02 |
| 14 - NGH Heater | 0.59 | 6.2E-02 | 8.0E-04 | 7.5E-02 | 2.9E-03 | N/A | 9.5E-02 | 7.1E-03 | 1.4E-02 | 3.3E-02 | 2.3E-02 |
| 2 - AFM/27M-1 Jacking Manifold | 0.13 | 1.3E-02 | 1.7E-04 | 1.6E-02 | 6.3E-04 | N/A | 2.0E-02 | 1.5E-03 | 2.9E-03 | 7.1E-03 | 4.9E-03 |
| 13 - NF-2D Light Cart | 2.26 | 2.4E-01 | 3.1E-03 | 2.9E-01 | 1.1E-02 | N/A | 3.7E-01 | 2.7E-02 | 5.2E-02 | 1.3E-01 | 8.8E-02 |
| Total (lb/yr) | 9.2E-01 | 1.2E-02 | 1.1E+00 | 4.4E-02 | 1.1E-03 | 1.4E+00 | 1.0E-01 | 2.0E-01 | 4.9E-01 | 3.4E-01 | |
| Grand Total (lb/yr) | 4.7E+00 | 6.1E-02 | 5.7E+00 | 2.2E-01 | 6.9E-02 | 7.4E+00 | 5.3E-01 | 1.0E+00 | 2.5E+00 | 1.8E+00 | |
| Grand Total (tons/yr) | 2.3E-03 | 3.0E-05 | 2.8E-03 | 1.1E-04 | 3.4E-05 | 3.7E-03 | 2.6E-04 | 5.1E-04 | 1.3E-03 | 8.8E-04 | |

Section 5 **Government Owned Vehicles (GOV)**

5.0 General

Vehicle emissions are based on USEPA vehicle emission standards for each vehicle type. Emission factors are specific to a calendar year.

A definition of each vehicle type category can be found in Table 5-1. Criteria and HAP emission factors are provided in Tables 5-2 and 5-3. CY 2004 criteria pollutant and HAP emissions from GOVs are provided in Tables 5-4 and 5-5. Government vehicle lists are provided in Appendix D.

5.1 Emission Calculations

Emissions are based on the total miles driven by each vehicle type and the average vehicle model year of that type vehicle. The 9 LRS/LGRVM and the 9 SVS/SVRG provided the list of government vehicles and the mileage driven during CY 2004

The criteria and hazardous air pollutant emissions for government vehicles were calculated using the following formula:

$$E_{pol} = VMT * EF * 0.002205$$

Where,

E_{pol} = Emissions of particular pollutant (lb/yr)

VMT = Vehicle miles traveled (mi)

EF = Emission factor for a specified pollutant, vehicle class, and model year (g/mi)

0.002205 = Factor for converting grams to pounds (lb/g)

Sample Emission Calculation

The following is an example of NOx emissions for the light duty gasoline vehicles (LDGV):

Vehicle category: LDGV

Average vehicle model year: 1996

Total CY2004 mile driven: 302,332 mi/yr

NO_x emission factor: 1.7 g/mi

Conversion factor: 0.002205 lb/g

$$E_{poll} = VMT * EF * 0.002205$$

$$E_{NOx} = (302,332 \text{ mi/yr}) * 1.7 \text{ g/mi} * 0.002205 \text{ lb/g} = \mathbf{1,133.1 \text{ lb/yr}}$$

5.2 References

1. U.S. Air Force - *Air Emissions Inventory Guidance for Mobile Sources at Air Force Installations* (Revised December 2003) (Section 3), IERA-RS-BR-SR-2001-0010, January 2002, AFIERA/RSEQ, Brooks AFB, Texas.

Table 5-1 Vehicle Categories

| Vehicle Type | Description ¹ |
|--------------|---|
| LDGV | Light-duty gasoline-fueled vehicles (i.e., gasoline passenger cars) |
| LDGT1 | Light-duty gasoline-fueled trucks, type 1 (includes gasoline pickup trucks, sport utility vehicles, and vans with a GVW of 6,000 pounds or less) |
| LDGT2 | Light-duty gasoline-fueled trucks, type 2 (includes gasoline pickup trucks, sport utility vehicles, and vans with a GVW from 6,001 to 8,500 pounds) |
| HDGV | Heavy-duty gasoline-fueled vehicles (includes all gasoline vehicles with a GVW exceeding 8,500 pounds) |
| LDDV | Light-duty diesel-powered vehicles (i.e., diesel passenger cars) |
| LDDT | Light-duty diesel-powered trucks (includes diesel pickup trucks, sport utility vehicles, and vans with a GVW of 8,500 pounds or less) |
| HDDV | Heavy-duty diesel-powered vehicles (includes diesel trucks and buses with a GVW exceeding 8,500 pounds) |
| MC | Motorcycles |

¹GVW = Gross Vehicle Weight

Table 5-2 Government Vehicle Pollutant Emission Factors

| Vehicle Category | Model Year | NO_x (g/mi) | CO (g/mi) | VOC (g/mi) | PM₁₀ (g/mi) | SO_x (g/mi) |
|-------------------------|-------------------|----------------------------------|----------------------|-----------------------|-----------------------------------|----------------------------------|
| LDGV | 1996 | 1.7 | 26.3 | 2.4 | 0.7 | 0.072 |
| LDGT1 | 1993 | 2.8 | 39.8 | 4.0 | 1.1 | 0.096 |
| LDGT2 | 1994 | 2.7 | 39.5 | 3.7 | 2.6 | 0.098 |
| LDDT | 1996 | 1.4 | 1.8 | 0.9 | 0.1 | 0.157 |
| HDDV | 1992 | 8.2 | 12.1 | 2.0 | 0.5 | 0.512 |

Table 5-3 Government Vehicle Hazardous Air Pollutant Emission Factors

| Vehicle Category | Lead (g/mi) | Benzene (g/mi) | Acetaldehyde (g/mi) | Formaldehyde (g/mi) | 1,3-Butadiene (g/mi) | MTBE (g/mi) |
|-------------------------|------------------------|---------------------------|--------------------------------|--------------------------------|---------------------------------|------------------------|
| LDGV | 1.5E-03 | 4.3E-02 | 4.6E-03 | 1.2E-02 | 5.0E-03 | 1.6E-02 |
| LDGT1 | 2.0E-03 | 5.2E-02 | 6.0E-03 | 1.6E-02 | 6.2E-03 | 1.9E-02 |
| LDGT2 | 2.1E-03 | 7.4E-02 | 9.6E-03 | 2.8E-02 | 1.0E-02 | 2.2E-02 |
| LDDT | N/A | 2.0E-02 | 1.2E-02 | 3.9E-02 | 9.1E-03 | N/A |
| HDDV | N/A | 1.5E-02 | 4.0E-02 | 1.1E-01 | 8.5E-03 | N/A |

Table 5-4 Government Vehicle Criteria Pollutant Emissions

| Vehicle Category | Miles Driven (mi/yr) | NO_x (lb/yr) | CO (lb/yr) | VOC (lb/yr) | PM₁₀ (lb/yr) | SO_x (lb/yr) |
|----------------------------------|---------------------------------|-----------------------------------|-----------------------|------------------------|------------------------------------|-----------------------------------|
| LDGV | 302,332 | 1,133.10 | 17,529.78 | 1,599.68 | 473.24 | 47.99 |
| LDGT1 | 634,317 | 3,915.62 | 55,657.79 | 5,593.75 | 1,510.31 | 134.25 |
| LDGT2 | 182,858 | 1,088.46 | 15,923.83 | 1,491.60 | 1,040.09 | 39.51 |
| LDDT | 338,910 | 1,046.04 | 1,344.91 | 672.46 | 97.13 | 117.31 |
| HDDV | 224,469 | 4,057.95 | 5,987.95 | 989.74 | 247.44 | 253.37 |
| Total Emissions (lb/yr) | 11,241.18 | 96,444.26 | 10,347.22 | 3,368.21 | 592.43 | |
| Total Emissions (Tons/yr) | 5.62 | 48.22 | 5.17 | 1.68 | 0.30 | |

Table 5-5 Government Vehicle Hazardous Air Pollutant Emissions

| Vehicle Category | Lead (lb/yr) | Benzene (lb/yr) | Acetaldehyde (lb/yr) | Formaldehyde (lb/yr) | 1,3-Butadiene (lb/yr) | MTBE (lb/yr) |
|-------------------------|-------------------------|----------------------------|---------------------------------|---------------------------------|----------------------------------|-------------------------|
| LDGV | 1.0E+00 | 2.8E+01 | 3.1E+00 | 8.0E+00 | 3.3E+00 | 1.1E+01 |
| LDGT1 | 2.8E+00 | 7.2E+01 | 8.4E+00 | 2.3E+01 | 8.7E+00 | 2.7E+01 |
| LDGT2 | 8.5E-01 | 3.0E+01 | 3.9E+00 | 1.1E+01 | 4.2E+00 | 9.0E+00 |
| LDDT | N/A | 1.5E+01 | 9.3E+00 | 2.9E+01 | 6.8E+00 | N/A |
| HDDV | N/A | 7.2E+00 | 2.0E+01 | 5.4E+01 | 4.2E+00 | N/A |
| Total (lb/yr) | 4.6E+00 | 1.5E+02 | 4.4E+01 | 1.2E+02 | 2.7E+01 | 4.7E+01 |
| Total (Tons/yr) | 2.3E-03 | 7.6E-02 | 2.2E-02 | 6.2E-02 | 1.4E-02 | 2.3E-02 |

Section 6 **Privately Owned Vehicles (POV)**

6.0 General

The emissions from POVs for CY 2004 are based on the vehicle type, average model year, and the total miles driven. Vehicles are grouped into 14 classes. An average vehicle of 4 years was used to select the emission factors.

Table 6-1 provides traffic study vehicle count data. Table 6-2 is a Vehicle Class and Type Cross Reference chart. Tables 6-3 and 6-4 show the criteria pollutant and HAP emissions factors used in this report. Estimated on-base POV mileage for CY 2004 is provided in Table 6-5. CY 2004 criteria pollutant and HAP emissions for POVs are provided in Tables 6-6 and 6-7.

6.1 Emission Calculations

The equation used to calculate both the criteria and HAP emissions is shown below:

$$E_{pol} = (VMT_{MC} * EF_{MC}) + (VMT_{LDGV} * EF_{LDGV}) + VMT_{LDGT1} * EF_{LDGT1}) + \\(VMT_{LDGT2} * EF_{LDGT2}) + (VMT_{HDGV} * EF_{HDGV}) + (VMT_{LDDV} * EF_{LDDV}) + (VMT_{LDDT} * EF_{LDDT}) * (VMT_{HDDV} * EF_{HDDV}) * 0.002205$$

Where,

E_{pol} = Total emissions of particular pollutant (all vehicle emission classes)

EF_{POL} = Emission factor of a particular pollutant for a vehicle emissions class (g/mi)

VMT_{VEHCAT} = Estimated vehicle miles for a vehicle category during a year (mi/yr)

0.002205 lb/g = Factor for converting grams to pounds

Sample Calculation

The following is an example of NOx emissions for LDGT1.

Vehicle miles traveled (VMT_{LDGT1}): 3,733,485 mi/yr

LDGT1 Emission Factor (EF_{NOx}): 0.8 g/mi

$$E_{pol, \text{class}} = (VMT_{LDGT1} + EF_{LDGT1}) * 0.002205 \text{ lb/g}$$

$$E_{NOx, \text{LDGV}} = (3,733,485 \text{ mi/yr} * 0.8 \text{ g/mi}) * 0.002205 \text{ lb/g}$$

$$E_{NOx, \text{LDGV}} = 6585.87 \text{ lb/yr}$$

6.2 References

1. U.S. Air Force - *Air Emissions Inventory Guidance for Mobile Sources at Air Force Installations* (Revised December 2003) (Section 3), IERA-RS-BR-SR-2001-0010, January 2002, AFIERA/RSEQ, Brooks AFB, Texas.

Table 6-1 Privately Owned Vehicle Traffic

| Gate Name | Entrance/Exit Lane Monitored | No. of Vehicle (24 hrs) | MC | LDGV | LDGT1 | LDGT2 | HDGV | LDDV | LDDT | HDDV |
|-----------------------|-------------------------------------|--------------------------------|-----------|-------------|--------------|--------------|-------------|-------------|-------------|-------------|
| Main Gate | Both | 2445 | 13 | 1918 | 443 | 1 | 0 | 0 | 0 | 97 |
| Wheatland | Both | 1524 | 2 | 950 | 288 | 12 | 82 | 0 | 0 | 59 |
| Vasser Lake | Both | 604 | 0 | 585 | 12 | 6 | 0 | 0 | 0 | 1 |
| Grass Valley | Both | 325 | 0 | 314 | 2 | 8 | 0 | 0 | 0 | 1 |
| Base Housing | | 1100 | 0 | 550 | 550 | 0 | 0 | 0 | 0 | 0 |
| Total Vehicles | | 5998 | 21 | 4317 | 1295 | 27 | 82 | 0 | 0 | 74 |

Table 6-2 Vehicle Class and Description Cross Reference

| Vehicle Description | Vehicle Type Emission Factor Classification |
|---|--|
| Motocycles | MC |
| Passenger cars | LDGV |
| Pickups, vans, and other 2-axle, 4-tired single unit vehicles | LDGT1 |
| Buses | LDGT2 |
| Two-axle, six tire single unit vehicles | HDGV |
| Light Duty Diesel Vehicle | LDDV |
| Two axle trailer truck | LDDT |
| Three and more axles with or without trailers | HDDV |

Table 6-3 On-Road Vehicle Criteria Pollutant Emission Factors

| Vehicle Category | Average Model Year | NO_x (g/mi) | CO (g/mi) | VOC (g/mi) | PM₁₀ (g/mi) | SO_x (g/mi) |
|-------------------------|---------------------------|------------------------------|------------------|-------------------|-------------------------------|------------------------------|
| MC | 2000 | 0.9 | 21.2 | 4.4 | 0.0 | 0.0 |
| LDGV | 2000 | 0.7 | 10.2 | 0.6 | 0.0 | 0.1 |
| LDGT1 | 2000 | 0.8 | 11.7 | 0.7 | 0.0 | 0.1 |
| LDGT2 | 2000 | 1.0 | 12.1 | 0.7 | 0.0 | 0.1 |
| HDGV | 2000 | 3.2 | 15.6 | 1.4 | 0.1 | 0.2 |
| LDDV | 2000 | 1.1 | 1.4 | 0.5 | 0.1 | 0.1 |
| LDDT | 2000 | 1.2 | 1.6 | 0.7 | 0.1 | 0.2 |
| HDDV | 2000 | 6.5 | 10.7 | 2.0 | 0.1 | 0.5 |

Table 6-4 On-Road Vehicle HAP Pollutant Emission Factors

| Vehicle Category | Lead (g/mi) | Benzene (g/mi) | Acetaldehyde (g/mi) | Formaldehyde (g/mi) | 1,3-Butadiene (g/mi) | MTBE (g/mi) |
|-------------------------|--------------------|-----------------------|----------------------------|----------------------------|-----------------------------|--------------------|
| MC | 1.2E-03 | 7.9E-02 | 1.8E-02 | 6.2E-02 | 2.4E-02 | 5.3E-02 |
| LDGV | 1.5E-03 | 3.1E-02 | 3.2E-03 | 7.6E-03 | 3.7E-03 | 1.1E-02 |
| LDGT1 | 2.0E-03 | 3.8E-02 | 4.1E-03 | 1.0E-02 | 4.7E-03 | 1.2E-02 |
| LDGT2 | 2.1E-03 | 5.8E-02 | 6.8E-03 | 1.8E-02 | 7.7E-03 | 1.5E-02 |
| HDGV | 3.3E-03 | 8.6E-02 | 1.6E-02 | 6.6E-02 | 1.2E-02 | 2.9E-02 |
| LDDV | ND | 7.8E-03 | 4.8E-03 | 1.5E-02 | 3.5E-03 | ND |
| LDDT | ND | 1.5E-02 | 9.0E-03 | 2.8E-02 | 6.6E-03 | ND |
| HDDV | ND | 1.2E-02 | 3.2E-02 | 8.6E-02 | 6.7E-03 | ND |

Table 6-5 Miles Driven by Privately Owned Vehicles

| Vehicle Category | Total Number of Vehicles Per Day | Workday Miles Driven¹ (mi/day) | Weekend Miles Driven² (mi/day) | Total Workday Miles Driven (mi/yr) | Total Weekend Miles Driven (mi/yr) | Total Miles Driven (mi/yr) |
|-------------------------|---|--|--|---|---|-----------------------------------|
| MC | 21 | 202 | 101 | 47,425 | 13,118 | 60,543 |
| LDGV | 4317 | 41,486 | 20,743 | 9,749,297 | 2,696,614 | 12,445,911 |
| LDGT1 | 1295 | 12,445 | 6,222 | 2,924,563 | 808,922 | 3,733,485 |
| LDGT2 | 27 | 259 | 130 | 60,975 | 16,866 | 77,841 |
| HDGV | 82 | 788 | 394 | 185,185 | 51,221 | 236,406 |
| LDDV | 0 | 0 | 0 | 0 | 0 | 0 |
| LDDT | 0 | 0 | 0 | 0 | 0 | 0 |
| HDDV | 74 | 711 | 356 | 167,118 | 46,224 | 213,342 |

¹ Assumes each vehicle makes 1 complete trip (9.61 Miles) across the base each day.

² Assumes that vehicle traffic is 50% less on the weekend/holidays.

Table 6-6 Criteria Pollutant Emissions from Privately Owned Vehicles

| Vehicle Category | Miles Driven On Base (mi/yr) | NO_x (lb/yr) | CO (lb/yr) | VOC (lb/yr) | PM₁₀ (lb/yr) | SO_x (lb/yr) |
|-------------------------|-------------------------------------|-------------------------------|-------------------|--------------------|--------------------------------|-------------------------------|
| MC | 60,543 | 120.15 | 2,830.14 | 587.39 | 0.40 | 4.27 |
| LDGV | 12,445,911 | 19,210.26 | 279,920.98 | 16,465.94 | 301.88 | 1,975.91 |
| LDGT1 | 3,733,485 | 6,585.87 | 96,318.31 | 5,762.63 | 107.02 | 790.30 |
| LDGT2 | 77,841 | 171.64 | 2,076.84 | 120.15 | 2.23 | 16.82 |
| HDGV | 236,406 | 1,668.08 | 8,131.89 | 729.79 | 34.40 | 80.28 |
| LDDV | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| LDDT | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| HDDV | 213,342 | 3,057.72 | 5,033.48 | 940.84 | 58.33 | 240.85 |
| Total (lb/yr) | 30,813.72 | 394,311.66 | 24,606.73 | 504.26 | 3,108.44 | |
| Total (ton/yr) | 15.41 | 197.16 | 12.30 | 0.25 | 1.55 | |

Table 6-7 HAP Pollutant Emissions from Privately Owned Vehicles

| Vehicle Category | Lead (lb/yr) | Benzene (lb/yr) | Acetaldehyde (lb/yr) | Formaldehyde (lb/yr) | 1,3-Butadiene (lb/yr) | MTBE (lb/yr) |
|-------------------------|---------------------|------------------------|-----------------------------|-----------------------------|------------------------------|---------------------|
| MC | 1.6E-01 | 1.1E+01 | 2.4E+00 | 8.3E+00 | 3.2E+00 | 7.1E+00 |
| LDGV | 4.1E+01 | 8.5E+02 | 8.8E+01 | 2.1E+02 | 1.0E+02 | 2.9E+02 |
| LDGT1 | 1.6E+01 | 3.1E+02 | 3.4E+01 | 8.6E+01 | 3.8E+01 | 9.7E+01 |
| LDGT2 | 3.6E-01 | 9.9E+00 | 1.2E+00 | 3.0E+00 | 1.3E+00 | 2.6E+00 |
| HDGV | 1.7E+00 | 4.5E+01 | 8.2E+00 | 3.4E+01 | 6.3E+00 | 1.5E+01 |
| LDDV | ND | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | ND |
| LDDT | ND | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | ND |
| HDDV | ND | 5.5E+00 | 1.5E+01 | 4.1E+01 | 3.2E+00 | ND |
| Total (lb/yr) | 6.0E+01 | 1.2E+03 | 1.5E+02 | 3.8E+02 | 1.5E+02 | 4.1E+02 |
| Total (ton/yr) | 3.0E-02 | 6.2E-01 | 7.4E-02 | 1.9E-01 | 7.7E-02 | 2.1E-01 |

Section 7

Non-road Vehicles/Non-vehicular Equipment

7.0 General

Non-road vehicles and non-vehicular equipment is a miscellaneous category of vehicles and equipment which does not fit under a specific mobile emissions source category. The data used in emissions calculations for these vehicles and equipment was provided by the Transportation Squadron, CE Heavy Equipment branch, and the Services Squadron.

Data for these non-road vehicles and equipment are provided in Table 7-1. Criteria and HAP emission factor for this equipment are provided in Tables 7-2 and 7-3. CY 2004 criteria and HAP emissions are provided on Tables 7-4 and 7-5.

7.1 Emission Calculations

The equation for calculating emissions for non-road/non-vehicular equipment is shown below:

$$E_{pol} = [PO * (LF / 100) * OT] * EF * 0.002205$$

Where,

- E_{pol} = Emissions of a particular pollutant (lb/yr)
PO = Rated power output of equipment (hp)
LF = Load Factor (%) for less than 100% max
100 = Conversion factor to covert percent to a fraction
OT = Operating time (hr/yr)
EF = Emission factor (g/hp-hr)
0.002205 lb/g = Factor for converting grams to pounds

Sample Calculation

The following is an example emission calculation for a backhoe:

- PO = 160 hp
LF = 55%
OT = 973 hr/yr
 NO_x emission factor: 8.5 g/hp-hr

$$E_{pol} = [PO * (LF / 100) * OT] * EF * 0.002205$$

$$E_{NOx} = [160 \text{ (hp)} * (55/100) * 973 \text{ (hr/yr)}] * 8.5 \text{ (g/hp-hr)} * 0.002205 \text{ lb/g}$$

$E_{NOx} = 1604.81 \text{ lb/yr}$

7.2 References

1. U.S. Air Force - *Air Emissions Inventory Guidance for Mobile Sources at Air Force Installations* (Revised December 2003) (Section 3), IERA-RS-BR-SR-2001-0010, January 2002, AFIERA/RSEQ, Brooks AFB, Texas.

Table 7-1 Non-Road/Non-Vehicular Equipment

| Equipment Type | Number in Operation | Fuel Type | Horsepower Rating (hp) | Total Operating Time (hr/yr) |
|-------------------------------------|---------------------|-----------|------------------------|------------------------------|
| String Trimmers | 7 | Gasoline | 1.0 | 960.0 |
| Skip Loader | 1 | Diesel | 230.0 | 72.0 |
| Backhoe | 2 | Diesel | 160.0 | 973.0 |
| Grader | 2 | Diesel | 135.0 | 358.0 |
| Dozer | 1 | Diesel | 200.0 | 137.0 |
| Crane | 1 | Diesel | 200.0 | 212.0 |
| Excavator | 1 | Diesel | 200.0 | 248.0 |
| Rough Mower | 2 | Diesel | 30 | 400.0 |
| Trap Sand Rake | 1 | Gasoline | 13 | 6.0 |
| Fairway Mower | 3 | Diesel | 30 | 1,400.0 |
| Rough Mower (2-20, 1-30, 1-55hp) | 2 | Diesel | 125 | 416.0 |
| Mower | 4 | Diesel | 25 | 1,680.0 |
| Green Mower | 3 | Gasoline | 20.5 | 1303 |
| Turf Truck (gator) | 1 | Gasoline | 15 | 380 |
| Farm Tractor | 1 | Diesel | 100 | 200 |
| Green Roller | 1 | Gasoline | 10 | 40 |
| Aerifier | 1 | Gasoline | 18 | 16 |
| Grain Keeper | 1 | Gasoline | 13 | 16 |
| Turf Truck (1800) | 4 | Gasoline | 23 | 90 |
| Chain Saw | 2 | Gasoline | 1 | 4 |
| Triplex Bank Mower | 2 | Diesel | 21.5 | 1500 |
| Leaf Blower | 6 | Gasoline | 0.5 | 338 |
| Sump Pump | 1 | Gasoline | 1 | 6 |
| Locomotive Engine | 1 | Diesel | 670 | 270 gal |
| Mini-Trucks | 4 | Diesel | 40 | 900 |
| Tractors | 1 | Diesel | 45 | 320 |
| Tractors | 1 | Diesel | 67 | 320 |
| Tractor | 3 | Diesel | 160 | 303 |
| Sweepr | 11 | Diesel | 250 | 24 |
| Sweepr | 3 | Diesel | 185 | 1200 |
| Warehouse Tug | 2 | Diesel | 185 | 338 |
| 4 Ton Forklift | 12 | Diesel | 65 | 1706 |
| 6 Ton Forklift Boom | 6 | Diesel | 185 | 1259 |
| 6 Ton Forklift | 15 | Diesel | 85 | 2660 |
| 25 Ton A/C Loader | 5 | Diesel | 200 | 553 |
| 40 Ton A/C Loader | 1 | Diesel | 225 | 12 |
| 10 Ton Forklifts | 10 | Diesel | 150 | 1330 |
| 10 Ton Forklift A/T | 2 | Diesel | 225 | 159 |
| AC Tug | 3 | Diesel | 185 | 327 |
| Welder | 1 | Diesel | 35 | 73 |
| Wharehouse Sweeper | 1 | Diesel | 25 | 51 |

Table 7-2 Non-Road/Non-Vehicular Equipment Emission Factors

| Equipment Type | Horsepower Rating (hp) | Load Factor (%) | NOx (g/hp-hr) | CO (g/hp-hr) | VOC (g/hp-hr) | PM₁₀ (g/hp-hr) | SO_x (g/hp-hr) |
|----------------------------------|-------------------------------|------------------------|----------------------|---------------------|----------------------|----------------------------------|---------------------------------|
| String Trimmers | 1 | 68 | 1.98 | 429 | 37 | 0.73 | 0.31 |
| Skip Loader | 230 | 55 | 7.1 | 2.3 | 0.9 | 0.8 | 1.26 |
| Backhoe | 160 | 55 | 8.5 | 8.1 | 2.2 | 1.5 | 1.4 |
| Grader | 135 | 61 | 8.3 | 3.4 | 0.6 | 0.5 | 1.05 |
| Dozer | 200 | 59 | 8.3 | 3.4 | 0.6 | 0.5 | 1.05 |
| Crane | 200 | 43 | 8.3 | 3.4 | 0.6 | 0.5 | 1.05 |
| Excavator | 200 | 57 | 7.1 | 11.6 | 3.9 | 1.6 | 1.38 |
| Rough Mower | 30 | 43 | 6.8 | 2.1 | 1.6 | 0.5 | 1.16 |
| Trap Sand Rake | 13 | 65 | 2.09 | 348 | 9.6 | 0.05 | 0.25 |
| Fairway Mower | 30 | 55 | 6.8 | 2.1 | 1.6 | 0.5 | 1.16 |
| Rough Mower (2-20, 1-30, 1-55hp) | 125 | 43 | 6.8 | 2.1 | 1.6 | 0.5 | 1.16 |
| Mower | 25 | 43 | 6.8 | 2.1 | 1.6 | 0.5 | 1.16 |
| Green Mower | 20.5 | 67 | 2.09 | 348 | 9.6 | 0.05 | 0.25 |
| Turf Truck (gator) | 15 | 67 | 9 | 975 | 100 | 1.15 | 0.18 |
| Farm Tractor | 100 | 65 | 2.27 | 8.94 | 11.21 | 2.05 | 0.87 |
| Green Roller | 10 | 56 | 9 | 975 | 100 | 1.15 | 0.18 |
| Aerifier | 18 | 78 | 9 | 975 | 100 | 1.15 | 0.18 |
| Grain Keeper | 13 | 78 | 9 | 975 | 100 | 1.15 | 0.18 |
| Turf Truck (1800) | 23 | 58 | 9 | 975 | 100 | 1.15 | 0.18 |
| Chain Saw | 1 | 92 | 0.94 | 719 | 214 | 3.6 | 0.22 |
| Triplex Bank Mower | 21.5 | 78 | 9 | 975 | 100 | 1.15 | 0.18 |
| Leaf Blower | 0.5 | 75 | 1.98 | 429 | 37 | 0.73 | 0.31 |
| Sump Pump | 1 | 69 | 1.98 | 429 | 37 | 0.73 | 0.31 |
| Locomotive Engine | 670 | 74 | 362 | 38.1 | 21 | 9.2 | 0.93 |
| Mini-Trucks | 40 | 65 | 8 | 5 | 1.22 | 0.9 | 0.93 |
| Tractors | 45 | 55 | 2.27 | 8.94 | 11.21 | 2.05 | 0.87 |
| Tractors | 67 | 55 | 2.27 | 8.94 | 11.21 | 2.05 | 0.87 |
| Tractor | 160 | 55 | 2.27 | 8.94 | 11.21 | 2.05 | 0.87 |
| Sweepr | 250 | 68 | 14 | 6.06 | 1.6 | 1.6 | 0.93 |
| Sweepr | 185 | 68 | 14 | 6.06 | 1.6 | 1.6 | 0.93 |
| Warehouse Tug | 185 | 62 | 14 | 6.06 | 1.6 | 1.6 | 0.93 |
| 4 Ton Forklift | 65 | 30 | 14 | 6.06 | 1.6 | 1.6 | 0.93 |
| 6 Ton Forklift Boom | 185 | 30 | 14 | 6.06 | 1.6 | 1.6 | 0.93 |
| 6 Ton Forklift | 85 | 30 | 14 | 6.06 | 1.6 | 1.6 | 0.93 |
| 25 Ton A/C Loader | 200 | 30 | 14 | 6.06 | 1.6 | 1.6 | 0.93 |
| 40 Ton A/C Loader | 225 | 30 | 14 | 6.06 | 1.6 | 1.6 | 0.93 |
| 10 Ton Forklifts | 150 | 30 | 14 | 6.06 | 1.6 | 1.6 | 0.93 |
| 10 Ton Forklift A/T | 225 | 30 | 14 | 6.06 | 1.6 | 1.6 | 0.93 |
| AC Tug | 185 | 51 | 14 | 6.06 | 1.6 | 1.6 | 0.93 |
| Welder | 35 | 45 | 8 | 5 | 1.22 | 1 | 0.93 |
| Warehouse Sweeper | 25 | 68 | 14 | 6.06 | 1.6 | 1.6 | 0.93 |

Table 7-3 Non-Road/Non-Vehicular Equipment HAP Emission Factors

| Pollutant | Weight Percent VOC Speciation by Engine Type | | |
|---------------------------|---|--------------------------------------|-----------------------|
| | 2-Stroke Gasoline Engines | 4-Stroke Gasoline Engines | Diesel Engines |
| Acetaldehyde | 0.166 | 0.41 | 7.43 |
| Acrolein | 0.03 | 0.07 | 1.15 |
| Benzene | 2.52 | 5.25 | 2.03 |
| 1,3-Butadiene | 0.215 | 0.952 | 0.186 |
| Ethylbenzene | 2.4 | 1.98 | 0.31 |
| Formaldehyde | 0.254 | 1.17 | 14.96 |
| Hexane | 1.42 | 0.992 | 0.159 |
| Methyl Tert-Butyl Ether | 14.67 | 16.01 | |
| Polycyclic Organic Matter | 3.00166 | 0.00151 | 0.000627 |
| Propionaldehyde | 0.0247 | 0.188 | 0.985 |
| Styrene | 0.13 | 0.0758 | 0.0594 |
| Toluene | 9.78 | 7.18 | 1.5 |
| Xylene | 10.75 | 6.78 | 1.06 |

Table 7-4 Non-Road/Non-Vehicular Equipment Criteria Emissions

| Equipment Type | NO_x (lb/yr) | CO (lb/yr) | VOC (lb/yr) | PM₁₀ (lb/yr) | SO_x (lb/yr) |
|-------------------------------------|-----------------------------------|-----------------------|------------------------|------------------------------------|-----------------------------------|
| String Trimmers | 2.85 | 617.51 | 53.26 | 1.05 | 0.45 |
| Skip Loader | 142.59 | 46.19 | 18.07 | 16.07 | 25.30 |
| Backhoe | 1,604.81 | 1,529.29 | 415.36 | 283.20 | 264.32 |
| Grader | 539.55 | 221.02 | 39.00 | 32.50 | 68.26 |
| Dozer | 295.86 | 121.20 | 21.39 | 17.82 | 37.43 |
| Crane | 333.67 | 136.69 | 24.12 | 20.10 | 42.21 |
| Excavator | 442.61 | 723.14 | 243.13 | 99.74 | 86.03 |
| Rough Mower | 77.37 | 23.89 | 18.20 | 5.69 | 13.20 |
| Trap Sand Rake | 0.23 | 38.90 | 1.07 | 0.01 | 0.03 |
| Fairway Mower | 346.36 | 106.96 | 81.50 | 25.47 | 59.09 |
| Rough Mower (2-20, 1-30, 1-55hp) | 335.27 | 103.54 | 78.89 | 24.65 | 57.19 |
| Mower | 270.79 | 83.63 | 63.72 | 19.91 | 46.19 |
| Green Mower | 82.48 | 13,732.86 | 378.84 | 1.97 | 9.87 |
| Turf Truck (gator) | 75.79 | 8,210.37 | 842.09 | 9.68 | 1.52 |
| Farm Tractor | 65.07 | 256.27 | 321.33 | 58.76 | 24.94 |
| Green Roller | 4.45 | 481.57 | 49.39 | 0.57 | 0.09 |
| Aerifier | 4.46 | 482.95 | 49.53 | 0.57 | 0.09 |
| Grain Keeper | 3.22 | 348.80 | 35.77 | 0.41 | 0.06 |
| Turf Truck (1800) | 23.83 | 2,581.14 | 264.73 | 3.04 | 0.48 |
| Chain Saw | 0.01 | 5.83 | 1.74 | 0.03 | 0.00 |
| Triplex Bank Mower | 499.20 | 54,080.11 | 5,546.68 | 63.79 | 9.98 |
| Leaf Blower | 0.55 | 119.90 | 10.34 | 0.20 | 0.09 |
| Sump Pump | 0.02 | 3.92 | 0.34 | 0.01 | 0.00 |
| Locomotive Engine | 215.28 | 22.66 | 12.50 | 5.47 | 24.17 |
| Mini-Trucks | 412.78 | 257.99 | 62.95 | 46.44 | 47.99 |
| Tractors | 39.64 | 156.12 | 195.77 | 35.80 | 15.19 |
| Tractors | 59.02 | 232.45 | 291.48 | 53.30 | 22.62 |
| Tractor | 133.46 | 525.62 | 659.08 | 120.53 | 51.15 |
| Sweepr | 125.95 | 54.52 | 14.39 | 14.39 | 8.37 |
| Sweepr | 4,660.14 | 2,017.17 | 532.59 | 532.59 | 309.57 |
| Warehouse Tug | 1,196.79 | 518.04 | 136.78 | 136.78 | 79.50 |
| 4 Ton Forklift | 1,026.95 | 444.52 | 117.37 | 117.37 | 68.22 |
| 6 Ton Forklift Boom | 2,157.03 | 933.68 | 246.52 | 246.52 | 143.29 |
| 6 Ton Forklift | 2,093.91 | 906.36 | 239.30 | 239.30 | 139.10 |
| 25 Ton A/C Loader | 1,024.27 | 443.36 | 117.06 | 117.06 | 68.04 |
| 40 Ton A/C Loader | 25.00 | 10.82 | 2.86 | 2.86 | 1.66 |
| 10 Ton Forklifts | 1,847.57 | 799.73 | 211.15 | 211.15 | 122.73 |
| 10 Ton Forklift A/T | 331.31 | 143.41 | 37.86 | 37.86 | 22.01 |
| AC Tug | 952.42 | 412.26 | 108.85 | 108.85 | 63.27 |
| Welder | 20.28 | 12.68 | 3.09 | 2.54 | 2.36 |
| Warehouse Sweeper | 26.76 | 11.59 | 3.06 | 3.06 | 1.78 |
| Total Emissions (lb/yr) | 21,499.59 | 91,958.66 | 11,551.14 | 2,717.11 | 1,937.81 |
| Total Emissions (tons/yr) | 10.75 | 45.98 | 5.78 | 1.36 | 0.97 |

Table 7-5 Non-Road/Non-Vehicular Equipment HAP Emissions

| Pollutant | 4-Stroke Gasoline Engines | Diesel Engines | Total (lb/yr) |
|---------------------------|------------------------------|----------------|------------------|
| Acetaldehyde | 2.80 | 7,093.74 | 7,096.54 |
| Acrolein | 0.51 | 6,905.80 | 6,906.31 |
| Benzene | 42.52 | 6,932.14 | 6,974.66 |
| 1,3-Butadiene | 3.63 | 6,876.96 | 6,880.58 |
| Ethylbenzene | 40.49 | 6,880.67 | 6,921.16 |
| Formaldehyde | 4.29 | 7,319.09 | 7,323.37 |
| Hexane | 23.96 | 6,876.15 | 6,900.10 |
| Methyl Tert-Butyl Ether | 247.50 | 6,871.39 | 7,118.89 |
| Polycyclic Organic Matter | 50.64 | 6,871.41 | 6,922.05 |
| Propionaldehyde | 0.42 | 6,900.87 | 6,901.28 |
| Styrene | 2.19 | 6,873.17 | 6,875.36 |
| Toluene | 165.00 | 6,916.28 | 7,081.28 |
| Xylene | 181.36 | 6,903.11 | 7,084.48 |

**Appendix A
Based Aircraft Emissions Worksheets**

Table A-1 C-135 Aircraft Engine Criteria Pollutant Emissions

| Criteria Pollutant | Landing and Takeoffs | Touch and Go | Low Fly By | Low Fly Pattern | Auxiliary Power Unit | Total (lb/yr) |
|---------------------------|-----------------------------|---------------------|-------------------|------------------------|-----------------------------|----------------------|
| NO _x | 18,642.14 | 50,833.04 | 4,952.58 | 6,748.06 | 1,877.69 | 83,053.50 |
| CO | 114,769.39 | 13,663.16 | 4,118.89 | 1,551.89 | 3,220.67 | 137,323.99 |
| VOC | 102,077.12 | 4,050.91 | 837.43 | 733.94 | 198.96 | 107,898.36 |
| PM ₁₀ | 12,128.27 | 19,062.03 | 3,517.72 | 4,084.21 | 273.57 | 39,065.80 |
| SO _x | 6,671.25 | 12,668.15 | 1,706.36 | 2,007.40 | 872.94 | 23,926.09 |

Table A-2 C-135 Aircraft Engine HAP Pollutant Emissions

| HAP | Landing and Takeoffs | Touch and Go | Low Fly By | Low Fly Pattern | Auxiliary Power Unit | Total (lb/yr) |
|--------------|-----------------------------|---------------------|-------------------|------------------------|-----------------------------|----------------------|
| Acetaldehyde | ND | ND | ND | ND | 7.1E-01 | 7.05E-01 |
| Acrolein | ND | ND | ND | ND | 1.0E-01 | 1.01E-01 |
| Benzene | 1.5E+01 | 5.4E+00 | 1.2E+00 | 6.4E-01 | 5.0E+00 | 2.73E+01 |
| Ethylbenzene | 1.2E+00 | 6.6E-01 | ND | ND | 4.0E-02 | 1.86E+00 |
| Formaldehyde | 1.0E+02 | 3.9E+01 | 6.2E+00 | 4.3E+00 | 6.7E+00 | 1.59E+02 |
| MEK | 5.2E+00 | ND | ND | ND | ND | 5.18E+00 |
| Naphthalene | 2.7E+00 | ND | ND | ND | ND | 2.73E+00 |
| Styrene | 1.4E+00 | ND | ND | ND | 6.4E-02 | 1.48E+00 |
| Toluene | 1.2E+01 | 9.8E+00 | 2.2E+00 | 1.1E+00 | 1.5E+00 | 2.64E+01 |
| Xylene | 2.9E+00 | 3.9E+00 | 8.1E-01 | 4.9E-01 | 9.1E-01 | 8.98E+00 |

Table A-3 T-38 Aircraft Engine Criteria Pollutant Emissions

| Criteria Pollutant | Landing and Takeoffs | Touch and Go | Low Fly By | Low Fly Pattern | Auxiliary Power Unit | Total (lb/yr) |
|---------------------------|-----------------------------|---------------------|-------------------|------------------------|-----------------------------|----------------------|
| NO _x | 4,226.50 | 8,524.49 | 852.45 | N/A | N/A | 13,603.44 |
| CO | 166,906.79 | 92,554.83 | 9,255.48 | N/A | N/A | 268,717.11 |
| VOC | 15,601.63 | 7,289.96 | 729.00 | N/A | N/A | 23,620.59 |
| PM ₁₀ | 7,584.25 | 8,846.22 | 884.62 | N/A | N/A | 17,315.09 |
| SO _x | 3,352.60 | 5,631.45 | 563.15 | N/A | N/A | 9,547.20 |

Table A-4 T-38 Aircraft Engine HAP Pollutant Emissions

| HAP | Landing and Takeoffs | Touch and Go | Low Fly By | Low Fly Pattern | Auxiliary Power Unit | Total (lb/yr) |
|--------------|-----------------------------|---------------------|-------------------|------------------------|-----------------------------|----------------------|
| Acetaldehyde | 1.8E+02 | 2.2E+01 | 2.2E+00 | N/A | N/A | 2.08E+02 |
| Acrolein | 1.6E+02 | 1.1E+01 | 1.1E+00 | N/A | N/A | 1.71E+02 |
| Benzene | 9.4E+00 | 2.4E+01 | 2.4E+00 | N/A | N/A | 3.54E+01 |
| Ethylbenzene | 5.8E+00 | 1.9E+00 | 1.9E-01 | N/A | N/A | 7.87E+00 |
| Formaldehyde | 1.8E+03 | 3.6E+02 | 3.6E+01 | N/A | N/A | 2.18E+03 |
| MEK | 6.3E+01 | 1.1E+01 | 1.1E+00 | N/A | N/A | 7.46E+01 |
| Naphthalene | 6.6E+01 | 1.4E+01 | 1.4E+00 | N/A | N/A | 8.16E+01 |
| Styrene | 6.5E+00 | 1.9E+00 | 1.9E-01 | N/A | N/A | 8.66E+00 |
| Toluene | 2.5E+01 | 9.0E+00 | 9.0E-01 | N/A | N/A | 3.50E+01 |
| Xylene | 3.4E+01 | 1.3E+01 | 1.3E+00 | N/A | N/A | 4.79E+01 |

Table A-5 U-2 Aircraft Engine Criteria Pollutant Emissions

| Criteria Pollutant | Landing and Takeoffs | Touch and Go | Low Fly By | Low Fly Pattern | Auxiliary Power Unit | Total (lb/yr) |
|---------------------------|-----------------------------|---------------------|-------------------|------------------------|-----------------------------|----------------------|
| NO _x | 22,077.15 | 68,623.36 | 17,155.84 | 26,497.21 | N/A | 134,353.56 |
| CO | 24,863.73 | 3,447.70 | 861.92 | 1,234.96 | N/A | 30,408.31 |
| VOC | 931.05 | 1,013.30 | 253.33 | 0.00 | N/A | 2,197.67 |
| PM ₁₀ | 3,420.66 | 7,968.94 | 1,992.23 | 2,618.21 | N/A | 16,000.04 |
| SO _x | 3,711.22 | 5,694.57 | 1,423.64 | 2,942.59 | N/A | 13,772.02 |

Table A-6 U-2 Aircraft Engine HAP Pollutant Emissions

| HAP | Landing and Takeoffs | Touch and Go | Low Fly By | Low Fly Pattern | Auxiliary Power Unit | Total (lb/yr) |
|--------------|-----------------------------|---------------------|-------------------|------------------------|-----------------------------|----------------------|
| Acetaldehyde | 8.5E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | N/A | 8.51E+00 |
| Acrolein | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | N/A | ND |
| Benzene | 3.1E+01 | 1.6E+00 | 3.9E-01 | 5.5E-01 | N/A | 3.38E+01 |
| Ethylbenzene | 1.6E+00 | 5.9E-01 | 1.5E-01 | 0.0E+00 | N/A | 2.29E+00 |
| Formaldehyde | 2.1E+02 | 2.5E+01 | 6.3E+00 | 1.7E+01 | N/A | 2.60E+02 |
| MEK | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | N/A | ND |
| Naphthalene | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | N/A | ND |
| Styrene | 2.6E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | N/A | 2.59E+00 |
| Toluene | 1.2E+01 | 2.2E+00 | 5.5E-01 | 4.4E-01 | N/A | 1.50E+01 |
| Xylene | 6.7E+00 | 2.8E+00 | 7.1E-01 | 4.9E-01 | N/A | 1.08E+01 |

Appendix B
Non-Based Aircraft Emissions Worksheets

Table B-1 A-10 Aircraft Engine Criteria Pollutant Emissions

| Criteria Pollutant | Landing and Takeoffs | Touch and Go | Low Fly By | Low Fly Pattern | Auxiliary Power Unit | Total (lb/yr) |
|--------------------|----------------------|--------------|------------|-----------------|----------------------|---------------|
| NO _x | 6.34 | N/A | N/A | N/A | N/A | 6.34 |
| CO | 165.56 | N/A | N/A | N/A | N/A | 165.56 |
| VOC | 37.62 | N/A | N/A | N/A | N/A | 37.62 |
| PM ₁₀ | 18.37 | N/A | N/A | N/A | N/A | 18.37 |
| SO _x | 4.94 | N/A | N/A | N/A | N/A | 4.94 |

Table B-2 A-10 Aircraft Engine HAP Pollutant Emissions

| HAP | Landing and Takeoffs | Touch and Go | Low Fly By | Low Fly Pattern | Auxiliary Power Unit | Total (lb/yr) |
|--------------|----------------------|--------------|------------|-----------------|----------------------|-----------------|
| Acetaldehyde | 2.4E-01 | N/A | N/A | N/A | N/A | 2.43E-01 |
| Acrolein | 1.2E-01 | N/A | N/A | N/A | N/A | 1.15E-01 |
| Benzene | 5.4E-01 | N/A | N/A | N/A | N/A | 5.43E-01 |
| Ethylbenzene | 5.0E-02 | N/A | N/A | N/A | N/A | 4.96E-02 |
| Formaldehyde | 2.3E+00 | N/A | N/A | N/A | N/A | 2.35E+00 |
| MEK | ND | N/A | N/A | N/A | N/A | ND |
| Naphthalene | 8.4E-02 | N/A | N/A | N/A | N/A | 8.36E-02 |
| Styrene | 8.4E-02 | N/A | N/A | N/A | N/A | 8.45E-02 |
| Toluene | 2.2E-01 | N/A | N/A | N/A | N/A | 2.20E-01 |
| Xylene | 1.5E-01 | N/A | N/A | N/A | N/A | 1.55E-01 |

Table B-3 B-707 Aircraft Engine Criteria Pollutant Emissions

| Criteria | Landing and Takeoffs | Touch and Go | Low Fly By | Low Fly Pattern | Auxiliary Power Unit | Total (lb/yr) |
|------------------|-----------------------------|---------------------|-------------------|------------------------|-----------------------------|----------------------|
| NO _x | 27.81 | N/A | N/A | N/A | 0.20 | 28.02 |
| CO | 233.13 | N/A | N/A | N/A | 0.77 | 233.90 |
| VOC | 201.50 | N/A | N/A | N/A | 0.04 | 201.54 |
| PM ₁₀ | 20.79 | N/A | N/A | N/A | 0.00 | 20.79 |
| SO _x | 9.64 | N/A | N/A | N/A | 0.22 | 9.86 |

Table B-4 B-707 Aircraft Engine HAP Pollutant Emissions

| HAP Pollutant | Landing and Takeoffs | Touch and Go | Low Fly By | Low Fly Pattern | Auxiliary Power Unit | Total (lb/yr) |
|----------------------|-----------------------------|---------------------|-------------------|------------------------|-----------------------------|----------------------|
| Acetaldehyde | 1.9E-02 | N/A | N/A | N/A | 2.3E-04 | 1.95E-02 |
| Acrolein | 0.0E+00 | N/A | N/A | N/A | 3.2E-05 | 3.24E-05 |
| Benzene | 1.3E+00 | N/A | N/A | N/A | 1.6E-03 | 1.33E+00 |
| Ethylbenzene | 1.6E-01 | N/A | N/A | N/A | 1.3E-05 | 1.62E-01 |
| Formaldehyde | 2.5E+00 | N/A | N/A | N/A | 2.2E-03 | 2.49E+00 |
| MEK | 0.0E+00 | N/A | N/A | N/A | ND | ND |
| Naphthalene | 4.0E-01 | N/A | N/A | N/A | ND | 3.98E-01 |
| Styrene | 2.0E-01 | N/A | N/A | N/A | 2.1E-05 | 2.04E-01 |
| Toluene | 5.0E-01 | N/A | N/A | N/A | 4.8E-04 | 4.98E-01 |
| Xylene | 3.7E-01 | N/A | N/A | N/A | 2.9E-04 | 3.72E-01 |

Table B-5 B-747 Aircraft Engine Criteria Pollutant Emissions

| Criteria Pollutant | Landing and Takeoffs | Touch and Go | Low Fly By | Low Fly Pattern | Auxiliary Power Unit | Total (lb/yr) |
|--------------------|----------------------|--------------|------------|-----------------|----------------------|---------------|
| NO _x | 129.14 | N/A | N/A | N/A | 2.96 | 132.10 |
| CO | 441.31 | N/A | N/A | N/A | 4.82 | 446.13 |
| VOC | 99.04 | N/A | N/A | N/A | 0.16 | 99.20 |
| PM ₁₀ | 141.80 | N/A | N/A | N/A | ND | 141.80 |
| SO _x | 53.57 | N/A | N/A | N/A | 0.86 | 54.44 |

Table B-6 B-747 Aircraft Engine HAP Pollutant Emissions

| HAP | Landing and Takeoffs | Touch and Go | Low Fly By | Low Fly Pattern | Auxiliary Power Unit | Total (lb/yr) |
|--------------|----------------------|--------------|------------|-----------------|----------------------|-----------------|
| Acetaldehyde | 1.8E+00 | N/A | N/A | N/A | 2.4E-03 | 1.78E+00 |
| Acrolein | 1.7E+00 | N/A | N/A | N/A | ND | 1.70E+00 |
| Benzene | 3.0E+00 | N/A | N/A | N/A | 1.7E-02 | 2.99E+00 |
| Ethylbenzene | 1.8E-01 | N/A | N/A | N/A | 3.8E-04 | 1.81E-01 |
| Formaldehyde | 1.2E+01 | N/A | N/A | N/A | 8.2E-03 | 1.19E+01 |
| MEK | 3.1E-01 | N/A | N/A | N/A | 7.8E-04 | 3.08E-01 |
| Naphthalene | 8.0E-01 | N/A | N/A | N/A | 2.4E-03 | 8.04E-01 |
| Styrene | 3.7E-01 | N/A | N/A | N/A | 9.9E-04 | 3.74E-01 |
| Toluene | 1.1E+00 | N/A | N/A | N/A | 8.2E-03 | 1.06E+00 |
| Xylene | 5.1E-01 | N/A | N/A | N/A | 2.6E-03 | 5.15E-01 |

Table B-7 C-5A Aircraft Engine Criteria Pollutant Emissions

| Criteria Pollutant | Landing and Takeoffs | Touch and Go | Low Fly By | Low Fly Pattern | Auxiliary Power Unit | Total (lb/yr) |
|--------------------|----------------------|--------------|------------|-----------------|----------------------|-----------------|
| NO _x | 819.04 | N/A | N/A | N/A | 98.40 | 917.44 |
| CO | 1,369.19 | N/A | N/A | N/A | 304.00 | 1,673.19 |
| VOC | 390.39 | N/A | N/A | N/A | 5.60 | 395.99 |
| PM ₁₀ | 94.60 | N/A | N/A | N/A | 10.40 | 105.00 |
| SO _x | 132.74 | N/A | N/A | N/A | 56.78 | 189.52 |

Table B-8 C-5A Aircraft Engine HAP Pollutant Emissions

| HAP | Landing and Takeoffs | Touch and Go | Low Fly By | Low Fly Pattern | Auxiliary Power Unit | Total (lb/yr) |
|--------------|----------------------|--------------|------------|-----------------|----------------------|-----------------|
| Acetaldehyde | 4.9E+00 | N/A | N/A | N/A | 1.2E-01 | 5.02E+00 |
| Acrolein | 4.8E+00 | N/A | N/A | N/A | ND | 4.83E+00 |
| Benzene | 8.3E+00 | N/A | N/A | N/A | 8.5E-01 | 9.19E+00 |
| Ethylbenzene | 5.0E-01 | N/A | N/A | N/A | 1.9E-02 | 5.16E-01 |
| Formaldehyde | 3.2E+01 | N/A | N/A | N/A | 4.1E-01 | 3.29E+01 |
| MEK | 8.5E-01 | N/A | N/A | N/A | 3.9E-02 | 8.94E-01 |
| Naphthalene | 2.2E+00 | N/A | N/A | N/A | 1.2E-01 | 2.36E+00 |
| Styrene | 1.0E+00 | N/A | N/A | N/A | 5.0E-02 | 1.09E+00 |
| Toluene | 3.0E+00 | N/A | N/A | N/A | 4.1E-01 | 3.41E+00 |
| Xylene | 1.4E+00 | N/A | N/A | N/A | 1.3E-01 | 1.51E+00 |

Table B-9 C-9 Aircraft Engine Criteria Pollutant Emissions

| Criteria Pollutant | Landing and Takeoffs | Touch and Go | Low Fly By | Low Fly Pattern | Auxiliary Power Unit | Total (lb/yr) |
|---------------------------|-----------------------------|---------------------|-------------------|------------------------|-----------------------------|----------------------|
| NO _x | 19.79 | N/A | N/A | N/A | 27.18 | 46.97 |
| CO | 172.23 | N/A | N/A | N/A | 46.62 | 218.85 |
| VOC | 48.53 | N/A | N/A | N/A | 2.88 | 51.41 |
| PM ₁₀ | 20.80 | N/A | N/A | N/A | 3.96 | 24.76 |
| SO _x | 17.34 | N/A | N/A | N/A | 9.83 | 27.17 |

Table B-10 C-9 Aircraft Engine HAP Pollutant Emissions

| HAP | Landing and Takeoffs | Touch and Go | Low Fly By | Low Fly Pattern | Auxiliary Power Unit | Total (lb/yr) |
|--------------|-----------------------------|---------------------|-------------------|------------------------|-----------------------------|----------------------|
| Acetaldehyde | 5.7E-02 | N/A | N/A | N/A | 2.8E-02 | 8.48E-02 |
| Acrolein | 0.0E+00 | N/A | N/A | N/A | ND | ND |
| Benzene | 3.9E+00 | N/A | N/A | N/A | 1.9E-01 | 4.12E+00 |
| Ethylbenzene | 4.8E-01 | N/A | N/A | N/A | 4.3E-03 | 4.83E-01 |
| Formaldehyde | 6.1E+00 | N/A | N/A | N/A | 9.3E-02 | 6.21E+00 |
| MEK | 0.0E+00 | N/A | N/A | N/A | 8.8E-03 | 8.85E-03 |
| Naphthalene | 1.2E+00 | N/A | N/A | N/A | 2.8E-02 | 1.21E+00 |
| Styrene | 6.0E-01 | N/A | N/A | N/A | 1.1E-02 | 6.14E-01 |
| Toluene | 1.5E+00 | N/A | N/A | N/A | 9.3E-02 | 1.56E+00 |
| Xylene | 1.1E+00 | N/A | N/A | N/A | 3.0E-02 | 1.13E+00 |

Table B-11 C-12F Aircraft Engine Criteria Pollutant Emissions

| Criteria Pollutant | Landing and Takeoffs | Touch and Go | Low Fly By | Low Fly Pattern | Auxiliary Power Unit | Total (lb/yr) |
|--------------------|----------------------|--------------|------------|-----------------|----------------------|---------------|
| NO _x | 9.52 | N/A | N/A | N/A | N/A | 9.52 |
| CO | 196.54 | N/A | N/A | N/A | N/A | 196.54 |
| VOC | 88.89 | N/A | N/A | N/A | N/A | 88.89 |
| PM ₁₀ | 6.16 | N/A | N/A | N/A | N/A | 6.16 |
| SO _x | 5.15 | N/A | N/A | N/A | N/A | 5.15 |

Table B-12 C-12F Aircraft Engine HAP Pollutant Emissions

| HAP | Landing and Takeoffs | Touch and Go | Low Fly By | Low Fly Pattern | Auxiliary Power Unit | Total (lb/yr) |
|--------------|----------------------|--------------|------------|-----------------|----------------------|-----------------|
| Acetaldehyde | 4.4E-01 | N/A | N/A | N/A | N/A | 4.43E-01 |
| Acrolein | 1.1E+00 | N/A | N/A | N/A | N/A | 1.12E+00 |
| Benzene | 8.6E-02 | N/A | N/A | N/A | N/A | 8.58E-02 |
| Ethylbenzene | 7.4E-02 | N/A | N/A | N/A | N/A | 7.41E-02 |
| Formaldehyde | 9.3E+00 | N/A | N/A | N/A | N/A | 9.28E+00 |
| MEK | 1.1E+00 | N/A | N/A | N/A | N/A | 1.11E+00 |
| Naphthalene | 2.5E-02 | N/A | N/A | N/A | N/A | 2.49E-02 |
| Styrene | 8.2E-02 | N/A | N/A | N/A | N/A | 8.24E-02 |
| Toluene | 2.7E-01 | N/A | N/A | N/A | N/A | 2.66E-01 |
| Xylene | 8.3E-02 | N/A | N/A | N/A | N/A | 8.28E-02 |

Table B-13 C-17 Aircraft Engine Criteria Pollutant Emissions

| Criteria Pollutant | Landing and Takeoffs | Touch and Go | Low Fly By | Low Fly Pattern | Auxiliary Power Unit | Total (lb/yr) |
|---------------------------|-----------------------------|---------------------|-------------------|------------------------|-----------------------------|----------------------|
| NO _x | 181.12 | N/A | N/A | N/A | 3.43 | 184.55 |
| CO | 172.59 | N/A | N/A | N/A | 1.40 | 173.99 |
| VOC | 16.49 | N/A | N/A | N/A | 0.15 | 16.64 |
| PM ₁₀ | 98.80 | N/A | N/A | N/A | 0.16 | 98.96 |
| SO _x | 27.24 | N/A | N/A | N/A | 0.70 | 27.95 |

Table B-14 C-17 Aircraft Engine HAP Pollutant Emissions

| HAP | Landing and Takeoffs | Touch and Go | Low Fly By | Low Fly Pattern | Auxiliary Power Unit | Total (lb/yr) |
|--------------|-----------------------------|---------------------|-------------------|------------------------|-----------------------------|----------------------|
| Acetaldehyde | 8.4E-02 | N/A | N/A | N/A | 5.7E-04 | 8.48E-02 |
| Acrolein | ND | N/A | N/A | N/A | 8.1E-05 | 8.10E-05 |
| Benzene | 1.6E-01 | N/A | N/A | N/A | 4.1E-03 | 1.63E-01 |
| Ethylbenzene | 2.1E-02 | N/A | N/A | N/A | 3.2E-05 | 2.11E-02 |
| Formaldehyde | 1.7E+00 | N/A | N/A | N/A | 5.4E-03 | 1.71E+00 |
| MEK | ND | N/A | N/A | N/A | ND | ND |
| Naphthalene | 1.7E-02 | N/A | N/A | N/A | ND | 1.69E-02 |
| Styrene | 1.1E-02 | N/A | N/A | N/A | 5.1E-05 | 1.06E-02 |
| Toluene | 5.4E-02 | N/A | N/A | N/A | 1.2E-03 | 5.57E-02 |
| Xylene | 2.7E-02 | N/A | N/A | N/A | 7.3E-04 | 2.73E-02 |

Table B-15 C-21 Aircraft Engine Criteria Pollutant Emissions

| Criteria Pollutant | Landing and Takeoffs | Touch and Go | Low Fly By | Low Fly Pattern | Auxiliary Power Unit | Total (lb/yr) |
|--------------------|----------------------|--------------|------------|-----------------|----------------------|---------------|
| NO _x | 13.74 | N/A | N/A | N/A | N/A | 13.74 |
| CO | 62.10 | N/A | N/A | N/A | N/A | 62.10 |
| VOC | 10.50 | N/A | N/A | N/A | N/A | 10.50 |
| PM ₁₀ | 4.61 | N/A | N/A | N/A | N/A | 4.61 |
| SO _x | 3.86 | N/A | N/A | N/A | N/A | 3.86 |

Table B-16 C-21 Aircraft Engine HAP Pollutant Emissions

| HAP | Landing and Takeoffs | Touch and Go | Low Fly By | Low Fly Pattern | Auxiliary Power Unit | Total (lb/yr) |
|--------------|----------------------|--------------|------------|-----------------|----------------------|-----------------|
| Acetaldehyde | ND | N/A | N/A | N/A | N/A | ND |
| Acrolein | ND | N/A | N/A | N/A | N/A | ND |
| Benzene | 1.8E-02 | N/A | N/A | N/A | N/A | 1.78E-02 |
| Ethylbenzene | 1.5E-03 | N/A | N/A | N/A | N/A | 1.48E-03 |
| Formaldehyde | 1.2E-01 | N/A | N/A | N/A | N/A | 1.19E-01 |
| MEK | 6.4E-03 | N/A | N/A | N/A | N/A | 6.38E-03 |
| Naphthalene | 3.4E-03 | N/A | N/A | N/A | N/A | 3.37E-03 |
| Styrene | 1.7E-03 | N/A | N/A | N/A | N/A | 1.74E-03 |
| Toluene | 1.3E-02 | N/A | N/A | N/A | N/A | 1.33E-02 |
| Xylene | 3.0E-03 | N/A | N/A | N/A | N/A | 3.00E-03 |

Table B-17 C-37 Aircraft Engine Criteria Pollutant Emissions

| Criteria Pollutant | Landing and Takeoffs | Touch and Go | Low Fly By | Low Fly Pattern | Auxiliary Power Unit | Total (lb/yr) |
|---------------------------|-----------------------------|---------------------|-------------------|------------------------|-----------------------------|----------------------|
| NO _x | 6.00 | N/A | N/A | N/A | 0.40 | 6.41 |
| CO | 17.49 | N/A | N/A | N/A | 0.08 | 17.57 |
| VOC | 0.06 | N/A | N/A | N/A | 0.01 | 0.07 |
| PM ₁₀ | 2.88 | N/A | N/A | N/A | ND | 2.88 |
| SO _x | 1.20 | N/A | N/A | N/A | 0.22 | 1.42 |

Table B-18 C-37 Aircraft Engine HAP Pollutant Emissions

| HAP | Landing and Takeoffs | Touch and Go | Low Fly By | Low Fly Pattern | Auxiliary Power Unit | Total (lb/yr) |
|--------------|-----------------------------|---------------------|-------------------|------------------------|-----------------------------|----------------------|
| Acetaldehyde | ND | N/A | N/A | N/A | 6.1E-04 | 6.12E-04 |
| Acrolein | ND | N/A | N/A | N/A | ND | ND |
| Benzene | 5.5E-03 | N/A | N/A | N/A | 4.3E-03 | 9.79E-03 |
| Ethylbenzene | 4.5E-04 | N/A | N/A | N/A | 9.6E-05 | 5.50E-04 |
| Formaldehyde | 3.7E-02 | N/A | N/A | N/A | 2.1E-03 | 3.90E-02 |
| MEK | 2.0E-03 | N/A | N/A | N/A | 2.0E-04 | 2.18E-03 |
| Naphthalene | 1.0E-03 | N/A | N/A | N/A | 6.1E-04 | 1.66E-03 |
| Styrene | 5.4E-04 | N/A | N/A | N/A | 2.5E-04 | 7.93E-04 |
| Toluene | 4.1E-03 | N/A | N/A | N/A | 2.1E-03 | 6.18E-03 |
| Xylene | 9.2E-04 | N/A | N/A | N/A | 6.7E-04 | 1.59E-03 |

Table B-19 C-40 Aircraft Engine Criteria Pollutant Emissions

| Criteria Pollutant | Landing and Takeoffs | Touch and Go | Low Fly By | Low Fly Pattern | Auxiliary Power Unit | Total (lb/yr) |
|---------------------------|-----------------------------|---------------------|-------------------|------------------------|-----------------------------|----------------------|
| NO _x | N/A | N/A | N/A | N/A | 0.00 | ND |
| CO | N/A | N/A | N/A | N/A | 0.00 | ND |
| VOC | N/A | N/A | N/A | N/A | 0.00 | ND |
| PM ₁₀ | N/A | N/A | N/A | N/A | ND | ND |
| SO _x | N/A | N/A | N/A | N/A | 0.00 | ND |

Table B-20 C-40 Aircraft Engine HAP Pollutant Emissions

| HAP | Landing and Takeoffs | Touch and Go | Low Fly By | Low Fly Pattern | Auxiliary Power Unit | Total (lb/yr) |
|--------------|-----------------------------|---------------------|-------------------|------------------------|-----------------------------|----------------------|
| Acetaldehyde | N/A | N/A | N/A | N/A | 0.0E+00 | ND |
| Acrolein | N/A | N/A | N/A | N/A | ND | ND |
| Benzene | N/A | N/A | N/A | N/A | 0.0E+00 | ND |
| Ethylbenzene | N/A | N/A | N/A | N/A | 0.0E+00 | ND |
| Formaldehyde | N/A | N/A | N/A | N/A | 0.0E+00 | ND |
| MEK | N/A | N/A | N/A | N/A | 0.0E+00 | ND |
| Naphthalene | N/A | N/A | N/A | N/A | 0.0E+00 | ND |
| Styrene | N/A | N/A | N/A | N/A | 0.0E+00 | ND |
| Toluene | N/A | N/A | N/A | N/A | 0.0E+00 | ND |
| Xylene | N/A | N/A | N/A | N/A | 0.0E+00 | ND |

Table B-21 C-130 Aircraft Engine Criteria Pollutant Emissions

| Criteria Pollutant | Landing and Takeoffs | Touch and Go | Low Fly By | Low Fly Pattern | Auxiliary Power Unit | Total (lb/yr) |
|---------------------------|-----------------------------|---------------------|-------------------|------------------------|-----------------------------|----------------------|
| NO _x | 13.08 | N/A | N/A | N/A | 4.45 | 17.53 |
| CO | 5.26 | N/A | N/A | N/A | 14.87 | 20.13 |
| VOC | 2.21 | N/A | N/A | N/A | 1.02 | 3.23 |
| PM ₁₀ | 5.43 | N/A | N/A | N/A | 0.47 | 5.90 |
| SO _x | 3.23 | N/A | N/A | N/A | 0.54 | 3.77 |

Table B-22 C-130 Aircraft Engine HAP Pollutant Emissions

| HAP | Landing and Takeoffs | Touch and Go | Low Fly By | Low Fly Pattern | Auxiliary Power Unit | Total (lb/yr) |
|--------------|-----------------------------|---------------------|-------------------|------------------------|-----------------------------|----------------------|
| Acetaldehyde | 9.6E-03 | N/A | N/A | N/A | 5.7E-04 | 1.02E-02 |
| Acrolein | ND | N/A | N/A | N/A | 8.1E-05 | 8.10E-05 |
| Benzene | 6.8E-03 | N/A | N/A | N/A | 4.1E-03 | 1.08E-02 |
| Ethylbenzene | 3.3E-04 | N/A | N/A | N/A | 3.2E-05 | 3.60E-04 |
| Formaldehyde | 5.5E-02 | N/A | N/A | N/A | 5.4E-03 | 6.01E-02 |
| MEK | 1.6E-04 | N/A | N/A | N/A | ND | 1.58E-04 |
| Naphthalene | 1.6E-03 | N/A | N/A | N/A | ND | 1.61E-03 |
| Styrene | 1.6E-04 | N/A | N/A | N/A | 5.1E-05 | 2.07E-04 |
| Toluene | 3.7E-03 | N/A | N/A | N/A | 1.2E-03 | 4.90E-03 |
| Xylene | 9.2E-04 | N/A | N/A | N/A | 7.3E-04 | 1.65E-03 |

Table B-23 C-141 Aircraft Engine Criteria Pollutant Emissions

| Criteria Pollutant | Landing and Takeoffs | Touch and Go | Low Fly By | Low Fly Pattern | Auxiliary Power Unit | Total (lb/yr) |
|---------------------------|-----------------------------|---------------------|-------------------|------------------------|-----------------------------|----------------------|
| NO _x | 25.41 | N/A | N/A | N/A | 0.60 | 26.01 |
| CO | 482.58 | N/A | N/A | N/A | 1.04 | 483.61 |
| VOC | 445.45 | N/A | N/A | N/A | 0.06 | 445.52 |
| PM ₁₀ | 33.66 | N/A | N/A | N/A | 0.09 | 33.75 |
| SO _x | 15.54 | N/A | N/A | N/A | 0.28 | 15.82 |

Table B-24 C-141 Aircraft Engine HAP Pollutant Emissions

| HAP | Landing and Takeoffs | Touch and Go | Low Fly By | Low Fly Pattern | Auxiliary Power Unit | Total (lb/yr) |
|--------------|-----------------------------|---------------------|-------------------|------------------------|-----------------------------|----------------------|
| Acetaldehyde | 1.2E-02 | N/A | N/A | N/A | 2.3E-04 | 1.22E-02 |
| Acrolein | ND | N/A | N/A | N/A | 3.2E-05 | 3.24E-05 |
| Benzene | 1.8E+00 | N/A | N/A | N/A | 1.6E-03 | 1.79E+00 |
| Ethylbenzene | 6.7E-01 | N/A | N/A | N/A | 1.3E-05 | 6.74E-01 |
| Formaldehyde | 7.9E+00 | N/A | N/A | N/A | 2.2E-03 | 7.92E+00 |
| MEK | ND | N/A | N/A | N/A | ND | ND |
| Naphthalene | 1.2E+00 | N/A | N/A | N/A | ND | 1.25E+00 |
| Styrene | 8.1E-01 | N/A | N/A | N/A | 2.1E-05 | 8.11E-01 |
| Toluene | 1.3E+00 | N/A | N/A | N/A | 4.8E-04 | 1.26E+00 |
| Xylene | 1.6E+00 | N/A | N/A | N/A | 2.9E-04 | 1.55E+00 |

Table B-25 E-4B Aircraft Engine Criteria Pollutant Emissions

| Criteria Pollutant | Landing and Takeoffs | Touch and Go | Low Fly By | Low Fly Pattern | Auxiliary Power Unit | Total (lb/yr) |
|--------------------|----------------------|--------------|------------|-----------------|----------------------|-----------------|
| NO _x | 271.63 | N/A | N/A | N/A | 17.76 | 289.39 |
| CO | 1,364.05 | N/A | N/A | N/A | 28.90 | 1,392.94 |
| VOC | 303.10 | N/A | N/A | N/A | 0.96 | 304.06 |
| PM ₁₀ | 271.85 | N/A | N/A | N/A | ND | 271.85 |
| SO _x | 226.45 | N/A | N/A | N/A | 5.18 | 231.64 |

Table B-26 E-4B Aircraft Engine HAP Pollutant Emissions

| HAP | Landing and Takeoffs | Touch and Go | Low Fly By | Low Fly Pattern | Auxiliary Power Unit | Total (lb/yr) |
|--------------|----------------------|--------------|------------|-----------------|----------------------|-----------------|
| Acetaldehyde | 1.2E+01 | N/A | N/A | N/A | 1.5E-02 | 1.21E+01 |
| Acrolein | 1.2E+01 | N/A | N/A | N/A | ND | 1.17E+01 |
| Benzene | 2.0E+01 | N/A | N/A | N/A | 1.0E-01 | 2.05E+01 |
| Ethylbenzene | 1.2E+00 | N/A | N/A | N/A | 2.3E-03 | 1.20E+00 |
| Formaldehyde | 8.1E+01 | N/A | N/A | N/A | 4.9E-02 | 8.11E+01 |
| MEK | 2.1E+00 | N/A | N/A | N/A | 4.7E-03 | 2.11E+00 |
| Naphthalene | 5.5E+00 | N/A | N/A | N/A | 1.5E-02 | 5.53E+00 |
| Styrene | 2.6E+00 | N/A | N/A | N/A | 6.0E-03 | 2.56E+00 |
| Toluene | 7.3E+00 | N/A | N/A | N/A | 4.9E-02 | 7.31E+00 |
| Xylene | 3.4E+00 | N/A | N/A | N/A | 1.6E-02 | 3.40E+00 |

Table B-27 F-15 Aircraft Engine Criteria Pollutant Emissions

| Criteria Pollutant | Landing and Takeoffs | Touch and Go | Low Fly By | Low Fly Pattern | Auxiliary Power Unit | Total (lb/yr) |
|--------------------|----------------------|--------------|------------|-----------------|----------------------|---------------|
| NO _x | 79.20 | N/A | N/A | N/A | 0.10 | 79.30 |
| CO | 97.98 | N/A | N/A | N/A | 1.05 | 99.02 |
| VOC | 15.12 | N/A | N/A | N/A | 0.22 | 15.34 |
| PM ₁₀ | 11.44 | N/A | N/A | N/A | ND | 11.44 |
| SO _x | 11.24 | N/A | N/A | N/A | 0.05 | 11.29 |

Table B-28 F-15 Aircraft Engine HAP Pollutant Emissions

| HAP | Landing and Takeoffs | Touch and Go | Low Fly By | Low Fly Pattern | Auxiliary Power Unit | Total (lb/yr) |
|--------------|----------------------|--------------|------------|-----------------|----------------------|-----------------|
| Acetaldehyde | 8.2E-01 | N/A | N/A | N/A | 5.1E-05 | 8.23E-01 |
| Acrolein | 3.8E-01 | N/A | N/A | N/A | 7.3E-06 | 3.79E-01 |
| Benzene | 3.2E-01 | N/A | N/A | N/A | 3.7E-04 | 3.25E-01 |
| Ethylbenzene | 1.9E-02 | N/A | N/A | N/A | 2.9E-06 | 1.92E-02 |
| Formaldehyde | 3.3E+00 | N/A | N/A | N/A | 4.9E-04 | 3.33E+00 |
| MEK | 9.0E-02 | N/A | N/A | N/A | ND | 9.04E-02 |
| Naphthalene | 2.1E-01 | N/A | N/A | N/A | ND | 2.10E-01 |
| Styrene | 1.6E-02 | N/A | N/A | N/A | 4.7E-06 | 1.57E-02 |
| Toluene | 7.4E-02 | N/A | N/A | N/A | 1.1E-04 | 7.36E-02 |
| Xylene | 1.5E-01 | N/A | N/A | N/A | 6.6E-05 | 1.53E-01 |

TableBA-29 F-16 Aircraft Engine Criteria Pollutant Emissions

| Criteria Pollutant | Landing and Takeoffs | Touch and Go | Low Fly By | Low Fly Pattern | Auxiliary Power Unit | Total (lb/yr) |
|--------------------|----------------------|--------------|------------|-----------------|----------------------|---------------|
| NO _x | 51.67 | N/A | N/A | N/A | 6.95 | 58.62 |
| CO | 145.72 | N/A | N/A | N/A | 54.23 | 199.94 |
| VOC | 49.19 | N/A | N/A | N/A | 9.35 | 58.53 |
| PM ₁₀ | 34.47 | N/A | N/A | N/A | 0.33 | 34.80 |
| SO _x | 14.92 | N/A | N/A | N/A | 0.40 | 15.32 |

Table B-30 F-16 Aircraft Engine HAP Pollutant Emissions

| HAP | Landing and Takeoffs | Touch and Go | Low Fly By | Low Fly Pattern | Auxiliary Power Unit | Total (lb/yr) |
|--------------|----------------------|--------------|------------|-----------------|----------------------|-----------------|
| Acetaldehyde | 2.8E-02 | N/A | N/A | N/A | 3.2E-04 | 2.88E-02 |
| Acrolein | 2.6E-02 | N/A | N/A | N/A | 4.6E-05 | 2.56E-02 |
| Benzene | 2.2E-01 | N/A | N/A | N/A | 2.3E-03 | 2.20E-01 |
| Ethylbenzene | 3.7E-02 | N/A | N/A | N/A | 1.8E-05 | 3.66E-02 |
| Formaldehyde | 3.5E-01 | N/A | N/A | N/A | 3.1E-03 | 3.48E-01 |
| MEK | 3.6E-03 | N/A | N/A | N/A | ND | 3.60E-03 |
| Naphthalene | 7.1E-02 | N/A | N/A | N/A | ND | 7.10E-02 |
| Styrene | 1.6E-02 | N/A | N/A | N/A | 2.9E-05 | 1.62E-02 |
| Toluene | 1.3E-01 | N/A | N/A | N/A | 6.7E-04 | 1.29E-01 |
| Xylene | 7.4E-02 | N/A | N/A | N/A | 4.1E-04 | 7.43E-02 |

Table B-31 KC-10 Aircraft Engine Criteria Pollutant Emissions

| Criteria Pollutant | Landing and Takeoffs | Touch and Go | Low Fly By | Low Fly Pattern | Auxiliary Power Unit | Total (lb/yr) |
|---------------------------|-----------------------------|---------------------|-------------------|------------------------|-----------------------------|----------------------|
| NO _x | 411.17 | N/A | N/A | N/A | 41.52 | 452.69 |
| CO | 573.72 | N/A | N/A | N/A | 18.72 | 592.44 |
| VOC | 205.25 | N/A | N/A | N/A | 1.92 | 207.17 |
| PM ₁₀ | 40.24 | N/A | N/A | N/A | 0.00 | 40.24 |
| SO _x | 48.37 | N/A | N/A | N/A | 13.10 | 61.48 |

Table B-32 KC-10 Aircraft Engine HAP Pollutant Emissions

| HAP | Landing and Takeoffs | Touch and Go | Low Fly By | Low Fly Pattern | Auxiliary Power Unit | Total (lb/yr) |
|--------------|-----------------------------|---------------------|-------------------|------------------------|-----------------------------|----------------------|
| Acetaldehyde | 1.9E+00 | N/A | N/A | N/A | 3.7E-02 | 1.92E+00 |
| Acrolein | 1.9E+00 | N/A | N/A | N/A | ND | 1.86E+00 |
| Benzene | 3.2E+00 | N/A | N/A | N/A | 2.6E-01 | 3.47E+00 |
| Ethylbenzene | 1.9E-01 | N/A | N/A | N/A | 5.8E-03 | 1.96E-01 |
| Formaldehyde | 1.3E+01 | N/A | N/A | N/A | 1.2E-01 | 1.27E+01 |
| MEK | 3.3E-01 | N/A | N/A | N/A | 1.2E-02 | 3.43E-01 |
| Naphthalene | 8.6E-01 | N/A | N/A | N/A | 3.7E-02 | 8.97E-01 |
| Styrene | 4.0E-01 | N/A | N/A | N/A | 1.5E-02 | 4.17E-01 |
| Toluene | 1.2E+00 | N/A | N/A | N/A | 1.2E-01 | 1.28E+00 |
| Xylene | 5.4E-01 | N/A | N/A | N/A | 4.0E-02 | 5.82E-01 |

Table B-33 KC-135 Aircraft Engine Criteria Pollutant Emissions

| Criteria Pollutant | Landing and Takeoffs | Touch and Go | Low Fly By | Low Fly Pattern | Auxiliary Power Unit | Total (lb/yr) |
|--------------------|----------------------|--------------|------------|-----------------|----------------------|---------------|
| NO _x | 99.41 | N/A | N/A | N/A | N/A | 99.41 |
| CO | 315.08 | N/A | N/A | N/A | N/A | 315.08 |
| VOC | 10.16 | N/A | N/A | N/A | N/A | 10.16 |
| PM ₁₀ | 105.12 | N/A | N/A | N/A | N/A | 105.12 |
| SO _x | 42.12 | N/A | N/A | N/A | N/A | 42.12 |

Table B-34 KC-135 Aircraft Engine HAP Pollutant Emissions

| HAP | Landing and Takeoffs | Touch and Go | Low Fly By | Low Fly Pattern | Auxiliary Power Unit | Total (lb/yr) |
|--------------|----------------------|--------------|------------|-----------------|----------------------|-----------------|
| Acetaldehyde | ND | N/A | N/A | N/A | N/A | ND |
| Acrolein | ND | N/A | N/A | N/A | N/A | ND |
| Benzene | 1.6E-01 | N/A | N/A | N/A | N/A | 1.63E-01 |
| Ethylbenzene | 1.3E-02 | N/A | N/A | N/A | N/A | 1.30E-02 |
| Formaldehyde | 1.1E+00 | N/A | N/A | N/A | N/A | 1.09E+00 |
| MEK | 6.0E-02 | N/A | N/A | N/A | N/A | 5.96E-02 |
| Naphthalene | 3.1E-02 | N/A | N/A | N/A | N/A | 3.14E-02 |
| Styrene | 1.6E-02 | N/A | N/A | N/A | N/A | 1.63E-02 |
| Toluene | 1.2E-01 | N/A | N/A | N/A | N/A | 1.17E-01 |
| Xylene | 2.6E-02 | N/A | N/A | N/A | N/A | 2.56E-02 |

Table B-35 MH-60 Aircraft Engine Criteria Pollutant Emissions

| Criteria Pollutant | Landing and Takeoffs | Touch and Go | Low Fly By | Low Fly Pattern | Auxiliary Power Unit | Total (lb/yr) |
|--------------------|----------------------|--------------|------------|-----------------|----------------------|---------------|
| NO _x | 5.85 | N/A | N/A | N/A | 5.56 | 11.41 |
| CO | 8.10 | N/A | N/A | N/A | 43.38 | 51.48 |
| VOC | 5.59 | N/A | N/A | N/A | 7.48 | 13.07 |
| PM ₁₀ | 1.40 | N/A | N/A | N/A | 0.26 | 1.67 |
| SO _x | 1.60 | N/A | N/A | N/A | 0.65 | 2.25 |

Table B-36 NH-60 Aircraft Engine HAP Pollutant Emissions

| HAP | Landing and Takeoffs | Touch and Go | Low Fly By | Low Fly Pattern | Auxiliary Power Unit | Total (lb/yr) |
|--------------|----------------------|--------------|------------|-----------------|----------------------|-----------------|
| Acetaldehyde | 2.2E-02 | N/A | N/A | N/A | 6.8E-04 | 2.29E-02 |
| Acrolein | 1.2E-02 | N/A | N/A | N/A | 9.7E-05 | 1.24E-02 |
| Benzene | 5.1E-02 | N/A | N/A | N/A | 4.9E-03 | 5.63E-02 |
| Ethylbenzene | 3.7E-03 | N/A | N/A | N/A | 3.9E-05 | 3.69E-03 |
| Formaldehyde | 3.1E-01 | N/A | N/A | N/A | 6.5E-03 | 3.16E-01 |
| MEK | ND | N/A | N/A | N/A | ND | ND |
| Naphthalene | 7.6E-03 | N/A | N/A | N/A | ND | 7.56E-03 |
| Styrene | 6.5E-03 | N/A | N/A | N/A | 6.2E-05 | 6.52E-03 |
| Toluene | 1.7E-02 | N/A | N/A | N/A | 1.4E-03 | 1.84E-02 |
| Xylene | 1.2E-02 | N/A | N/A | N/A | 8.7E-04 | 1.32E-02 |

Table B-37 T-1A Aircraft Engine Criteria Pollutant Emissions

| Criteria Pollutant | Landing and Takeoffs | Touch and Go | Low Fly By | Low Fly Pattern | Auxiliary Power Unit | Total (lb/yr) |
|--------------------|----------------------|--------------|------------|-----------------|----------------------|---------------|
| NO _x | 0.63 | N/A | N/A | N/A | N/A | 0.63 |
| CO | 11.30 | N/A | N/A | N/A | N/A | 11.30 |
| VOC | 7.85 | N/A | N/A | N/A | N/A | 7.85 |
| PM ₁₀ | 0.64 | N/A | N/A | N/A | N/A | 0.64 |
| SO _x | 0.30 | N/A | N/A | N/A | N/A | 0.30 |

Table B-38 T-1A Aircraft Engine HAP Pollutant Emissions

| HAP | Landing and Takeoffs | Touch and Go | Low Fly By | Low Fly Pattern | Auxiliary Power Unit | Total (lb/yr) |
|--------------|----------------------|--------------|------------|-----------------|----------------------|-----------------|
| Acetaldehyde | ND | N/A | N/A | N/A | N/A | ND |
| Acrolein | ND | N/A | N/A | N/A | N/A | ND |
| Benzene | 1.4E-03 | N/A | N/A | N/A | N/A | 1.45E-03 |
| Ethylbenzene | 1.2E-04 | N/A | N/A | N/A | N/A | 1.17E-04 |
| Formaldehyde | 9.7E-03 | N/A | N/A | N/A | N/A | 9.67E-03 |
| MEK | 5.3E-04 | N/A | N/A | N/A | N/A | 5.27E-04 |
| Naphthalene | 2.8E-04 | N/A | N/A | N/A | N/A | 2.78E-04 |
| Styrene | 1.4E-04 | N/A | N/A | N/A | N/A | 1.44E-04 |
| Toluene | 1.1E-03 | N/A | N/A | N/A | N/A | 1.06E-03 |
| Xylene | 2.3E-04 | N/A | N/A | N/A | N/A | 2.32E-04 |

Table B-39 T-38 Aircraft Engine Criteria Pollutant Emissions

| Criteria Pollutant | Landing and Takeoffs | Touch and Go | Low Fly By | Low Fly Pattern | Auxiliary Power Unit | Total (lb/yr) |
|--------------------|----------------------|--------------|------------|-----------------|----------------------|-----------------|
| NO _x | 31.23 | N/A | N/A | N/A | N/A | 31.23 |
| CO | 1,785.22 | N/A | N/A | N/A | N/A | 1,785.22 |
| VOC | 158.74 | N/A | N/A | N/A | N/A | 158.74 |
| PM ₁₀ | 95.47 | N/A | N/A | N/A | N/A | 95.47 |
| SO _x | 30.99 | N/A | N/A | N/A | N/A | 30.99 |

Table B-40 T-38 Aircraft Engine HAP Pollutant Emissions

| HAP | Landing and Takeoffs | Touch and Go | Low Fly By | Low Fly Pattern | Auxiliary Power Unit | Total (lb/yr) |
|--------------|----------------------|--------------|------------|-----------------|----------------------|-----------------|
| Acetaldehyde | 2.0E+00 | N/A | N/A | N/A | N/A | 2.03E+00 |
| Acrolein | 1.7E+00 | N/A | N/A | N/A | N/A | 1.74E+00 |
| Benzene | 1.2E-01 | N/A | N/A | N/A | N/A | 1.24E-01 |
| Ethylbenzene | 6.6E-02 | N/A | N/A | N/A | N/A | 6.63E-02 |
| Formaldehyde | 2.0E+01 | N/A | N/A | N/A | N/A | 1.99E+01 |
| MEK | 6.9E-01 | N/A | N/A | N/A | N/A | 6.94E-01 |
| Naphthalene | 7.1E-01 | N/A | N/A | N/A | N/A | 7.06E-01 |
| Styrene | 7.4E-02 | N/A | N/A | N/A | N/A | 7.43E-02 |
| Toluene | 2.9E-01 | N/A | N/A | N/A | N/A | 2.91E-01 |
| Xylene | 3.9E-01 | N/A | N/A | N/A | N/A | 3.87E-01 |

Table B-41 Two Engine Propeller Criteria Pollutant Emissions

| Criteria Pollutant | Landing and Takeoffs | Touch and Go | Low Fly By | Low Fly Pattern | Auxiliary Power Unit | Total (lb/yr) |
|---------------------------|-----------------------------|---------------------|-------------------|------------------------|-----------------------------|----------------------|
| NO _x | 435.15 | N/A | N/A | N/A | N/A | 435.15 |
| CO | 46,175.75 | N/A | N/A | N/A | N/A | 46,175.75 |
| VOC | 3,124.94 | N/A | N/A | N/A | N/A | 3,124.94 |
| PM ₁₀ | 2,102.58 | N/A | N/A | N/A | N/A | 2,102.58 |
| SO _x | 312.09 | N/A | N/A | N/A | N/A | 312.09 |

Table B-42 Two Engine Propeller HAP Pollutant Emissions IO360D Engine

| HAP | Landing and Takeoffs | Touch and Go | Low Fly By | Low Fly Pattern | Auxiliary Power Unit | Total (lb/yr) |
|--------------|-----------------------------|---------------------|-------------------|------------------------|-----------------------------|----------------------|
| Acetaldehyde | ND | N/A | N/A | N/A | N/A | ND |
| Acrolein | ND | N/A | N/A | N/A | N/A | ND |
| Benzene | ND | N/A | N/A | N/A | N/A | ND |
| Ethylbenzene | ND | N/A | N/A | N/A | N/A | ND |
| Formaldehyde | ND | N/A | N/A | N/A | N/A | ND |
| MEK | ND | N/A | N/A | N/A | N/A | ND |
| Naphthalene | ND | N/A | N/A | N/A | N/A | ND |
| Styrene | ND | N/A | N/A | N/A | N/A | ND |
| Toluene | ND | N/A | N/A | N/A | N/A | ND |
| Xylene | ND | N/A | N/A | N/A | N/A | ND |

Appendix C
On-Wing Engine Tests Emission Worksheets

Table C-1 U-2 Aircraft Engine Criteria Pollutant Emissions

| Criteria Pollutant | Idle | Approach | Intermediate | Military | Total (lb/yr) |
|---------------------------|-------------|-----------------|---------------------|-----------------|--------------------------|
| NO _x | 18.88 | N/A | N/A | 1,081.74 | 1,100.62 |
| CO | 92.08 | N/A | N/A | 21.24 | 113.32 |
| VOC | 2.60 | N/A | N/A | 0.00 | 2.60 |
| PM ₁₀ | 5.48 | N/A | N/A | 53.55 | 59.03 |
| SO _x | 8.78 | N/A | N/A | 65.32 | 74.10 |

Table C-2 U-2 Aircraft Engine HAP Pollutant Emissions

| HAP | Idle | Approach | Intermediate | Military | Total (lb/yr) |
|--------------|-------------|-----------------|---------------------|-----------------|--------------------------|
| Acetaldehyde | 3.3E-02 | N/A | N/A | 0.0E+00 | 3.26E-02 |
| Acrolein | 0.0E+00 | N/A | N/A | 0.0E+00 | ND |
| Benzene | 1.2E-01 | N/A | N/A | 1.1E-02 | 1.29E-01 |
| Ethylbenzene | 5.4E-03 | N/A | N/A | 0.0E+00 | 5.40E-03 |
| Formaldehyde | 7.9E-01 | N/A | N/A | 2.1E-01 | 1.00E+00 |
| MEK | 0.0E+00 | N/A | N/A | 0.0E+00 | ND |
| Naphthalene | 0.0E+00 | N/A | N/A | 0.0E+00 | ND |
| Styrene | 9.9E-03 | N/A | N/A | 0.0E+00 | 9.92E-03 |
| Toluene | 4.3E-02 | N/A | N/A | 1.3E-02 | 5.57E-02 |
| Xylene | 2.3E-02 | N/A | N/A | 7.8E-03 | 3.09E-02 |

Table C-3 KC-135E Aircraft Engine Criteria Pollutant Emissions

| Criteria Pollutant | Idle | Approach | Intermediate | Military | Total (lb/yr) |
|---------------------------|-------------|-----------------|---------------------|-----------------|--------------------------|
| NO _x | 50.88 | N/A | 808.91 | 479.16 | 1,338.96 |
| CO | 3,302.96 | N/A | 186.03 | 17.40 | 3,506.39 |
| VOC | 3,018.62 | N/A | 87.98 | 20.49 | 3,127.09 |
| PM ₁₀ | 173.05 | N/A | 489.59 | 113.33 | 775.96 |
| SO _x | 73.38 | N/A | 240.63 | 100.55 | 414.56 |

Table C-4 KC-135E Aircraft Engine HAP Pollutant Emissions

| HAP | Idle | Approach | Intermediate | Military | Total (lb/yr) |
|--------------|-------------|-----------------|---------------------|-----------------|--------------------------|
| Acetaldehyde | ND | N/A | ND | ND | ND |
| Acrolein | ND | N/A | ND | ND | ND |
| Benzene | 4.0E-01 | N/A | 7.7E-02 | 2.3E-02 | 4.95E-01 |
| Ethylbenzene | 2.8E-02 | N/A | ND | ND | 2.82E-02 |
| Formaldehyde | 2.7E+00 | N/A | 5.2E-01 | 2.7E-01 | 3.47E+00 |
| MEK | 1.6E-01 | N/A | ND | ND | 1.55E-01 |
| Naphthalene | 8.2E-02 | N/A | ND | ND | 8.18E-02 |
| Styrene | 4.2E-02 | N/A | ND | ND | 4.23E-02 |
| Toluene | 2.5E-01 | N/A | 1.3E-01 | 4.3E-02 | 4.26E-01 |
| Xylene | 4.8E-02 | N/A | 5.8E-02 | 1.9E-02 | 1.26E-01 |

Table C-5 KC-135E Aircraft Engine Criteria Pollutant Emissions

| Criteria Pollutant | Idle | Approach | Intermediate | Military | Total (lb/yr) |
|---------------------------|-------------|-----------------|---------------------|-----------------|--------------------------|
| NO _x | 57.60 | N/A | N/A | 542.45 | 600.05 |
| CO | 3,739.20 | N/A | N/A | 19.70 | 3,758.90 |
| VOC | 3,417.30 | N/A | N/A | 23.20 | 3,440.50 |
| PM ₁₀ | 195.90 | N/A | N/A | 128.30 | 324.20 |
| SO _x | 83.07 | N/A | N/A | 113.83 | 196.90 |

Table C-6 KC-135E Aircraft Engine HAP Pollutant Emissions

| HAP | Idle | Approach | Intermediate | Military | Total (lb/yr) |
|--------------|-------------|-----------------|---------------------|-----------------|--------------------------|
| Acetaldehyde | ND | N/A | N/A | ND | ND |
| Acrolein | ND | N/A | N/A | ND | ND |
| Benzene | 4.5E-01 | N/A | N/A | 2.6E-02 | 4.73E-01 |
| Ethylbenzene | 3.2E-02 | N/A | N/A | ND | 3.20E-02 |
| Formaldehyde | 3.0E+00 | N/A | N/A | 3.1E-01 | 3.34E+00 |
| MEK | 1.8E-01 | N/A | N/A | ND | 1.76E-01 |
| Naphthalene | 9.3E-02 | N/A | N/A | ND | 9.27E-02 |
| Styrene | 4.8E-02 | N/A | N/A | ND | 4.79E-02 |
| Toluene | 2.9E-01 | N/A | N/A | 4.8E-02 | 3.36E-01 |
| Xylene | 5.4E-02 | N/A | N/A | 2.2E-02 | 7.62E-02 |

Table C-7 T-38 Aircraft Engine Criteria Pollutant Emissions

| Criteria Pollutant | Idle | Approach | Military | Afterburner | Total (lb/yr) |
|---------------------------|-------------|-----------------|-----------------|--------------------|--------------------------|
| NO _x | 7.84 | N/A | 69.97 | 76.35 | 154.16 |
| CO | 770.16 | N/A | 435.09 | 652.75 | 1,858.00 |
| VOC | 74.56 | N/A | 7.79 | 68.85 | 151.20 |
| PM ₁₀ | 26.24 | N/A | 16.96 | 41.65 | 84.85 |
| SO _x | 8.35 | N/A | 30.03 | 41.04 | 79.42 |

Table C-8 T-38 Aircraft Engine HAP Pollutant Emissions

| HAP | Idle | Approach | Military | Afterburner | Total (lb/yr) |
|--------------|-------------|-----------------|-----------------|--------------------|--------------------------|
| Acetaldehyde | 1.0E+00 | N/A | 0.0E+00 | 4.1E-02 | 1.04E+00 |
| Acrolein | 8.8E-01 | N/A | 0.0E+00 | 2.1E-02 | 8.97E-01 |
| Benzene | 8.4E-03 | N/A | 2.0E-01 | 6.2E-02 | 2.65E-01 |
| Ethylbenzene | 2.9E-02 | N/A | 6.2E-03 | 1.0E-03 | 3.64E-02 |
| Formaldehyde | 9.4E+00 | N/A | 1.2E+00 | 4.9E-01 | 1.12E+01 |
| MEK | 3.3E-01 | N/A | 0.0E+00 | 2.1E-02 | 3.55E-01 |
| Naphthalene | 3.5E-01 | N/A | 2.1E-02 | 9.6E-02 | 4.63E-01 |
| Styrene | 3.3E-02 | N/A | 8.4E-03 | 1.4E-03 | 4.33E-02 |
| Toluene | 1.3E-01 | N/A | 5.4E-02 | 0.0E+00 | 1.79E-01 |
| Xylene | 1.7E-01 | N/A | 2.4E-01 | 1.2E-02 | 4.20E-01 |

Appendix D
Government Vehicle Listings

Table D-1 LDGV Government Owned Vehicle at Beale AFB

| Organization | Vin Number | Vehicle Description | Model Year | Fuel Type | 2004 Mileage |
|--------------------------------|-------------------|----------------------|------------|--------------------|----------------|
| 99 RS | 2G1FP22G422143488 | Camaro | 02 | Gasoline | 5955 |
| 99 RS | 2G1FP22G022143696 | Camaro | 02 | Gasoline | 5215 |
| 99 RS | 2G1FP22G822169947 | Camaro | 02 | Gasoline | 3407 |
| 99 RS | 2G1FP22G522169968 | Camaro | 02 | Gasoline | 2920 |
| 99 RS | 6G2VX12G04L231350 | GTO | 04 | Gasoline | 4771 |
| 99 RS | 2G1FP22PXS2200986 | Camaro | 95 | Gasoline | 673 |
| 99 RS | 2G1FP22PXS2200759 | Camaro | 95 | Gasoline | 459 |
| 99 RS | 2G1FP22P9V2144527 | Camaro | 97 | Gasoline | 2724 |
| 99 RS | 2G1FP22P0V2144075 | Camaro | 97 | Gasoline | 2827 |
| 99 RS | 2G1FP22P8V2134118 | Camaro | 97 | Gasoline | 2723 |
| 99 RS | 2G1FP22G4W2139611 | Camaro | 98 | Gasoline | 6176 |
| 99 RS | 2G1FP22G1X2137980 | Camaro | 99 | Gasoline | 5538 |
| 99 RS | 2G1FP22GXX2138559 | Camaro | 99 | Gasoline | 5144 |
| 99 RS | 2G1WF55K9Y9359213 | Impala | 00 | Gasoline | 34831 |
| 99 RS | 2G1WF55KX29295657 | Impala | 02 | Gasoline | 46463 |
| 99 RS | 2G1WF55K429295024 | Impala | 02 | Gasoline | 50484 |
| 99 RS | 2G1WF55KX29316457 | Impala | 02 | Gasoline | 39480 |
| 99 RS | 2G1WF55K929315851 | Impala | 02 | Gasoline | 23636 |
| 99 RS | 2G1WF55K229317067 | Impala | 02 | Gasoline | 23786 |
| 99 RS | 2G1WF55K349304606 | Impala | 04 | Gasoline | 20781 |
| 9 SVS | 287KB3179SK526775 | Dodge Van | 95 | Gasoline | 2458 |
| 9 SVS | 2FM2A53494BC54374 | Ford Windstar | 00 | Gasoline | 2783 |
| 9 SVS | 1GTCM15Z3NB528626 | GMC Saffari Mini-Van | 92 | Gasoline | 4789 |
| 9 SVS | 2GA6639KOP414740 | Chevy Van | 93 | Gasoline | 2578 |
| 9 SVS | 1GNMD19W64B222967 | Chevy Astro Van | 97 | Gasoline | 1731 |
| Average Model Year 1996 | | | | Total Miles | 302,332 |

Table D-2 LDGT1 Government Owned Vehicle at Beale AFB

| Organization | Vin Number | Vehicle Description | Model Year | Fuel Type | 2004 Mileage |
|--------------|-------------------|---------------------|------------|-----------|--------------|
| 9 MDG | 2B7HB21X0KK324720 | Panel Van | 89 | Gasoline | 640 |
| 9 MOS | 2B7HB21Y1NK171536 | Panel Van | 92 | Gasoline | 976 |
| 9 AMXS | 2B7HB21Y3NK171537 | Panel Van | 92 | Gasoline | 766 |
| 9 MDG | 2B7HB21Y5NK171538 | Panel Van | 92 | Gasoline | 3718 |
| 9 SDS | 2B7HB21Y7NK171539 | Panel Van | 92 | Gasoline | 300 |
| 9 CS | 2B7HB21Y3NK171540 | Panel Van | 92 | Gasoline | 2636 |
| 9 SDS | 2B4HB25Y9NK149405 | 8 Pax Van | 92 | Gasoline | 10996 |
| 9 CS | 2B4H825Y3RK126837 | 8 Pax Van | 94 | Gasoline | 3749 |
| 9 SDS | 2B4HB25YXRK126866 | 8 Pax Van | 94 | Gasoline | 6731 |
| 9 SDS | 1GNGK26KXPJ381459 | Suburban | 93 | Gasoline | 7165 |
| 9 SDS | 2B5WB35Z3KK315981 | 15 Pax Van | 89 | Gasoline | 1389 |
| 9 SFS | 2B5WB35Z5NK119626 | 15 Pax Van | 92 | Gasoline | 13445 |
| 9 SDS | 1GAGG39K9RF163300 | 15 Pax Van | 94 | Gasoline | 12496 |
| 9 SDS | 1GAGG39KXRF163192 | 15 Pax Van | 94 | Gasoline | 15021 |
| 9 SDS | 1GAGG39KXRF164360 | 15 Pax Van | 94 | Gasoline | 3425 |
| 9 SFS | 1GNEV18K7JF184099 | Blazer | 88 | Gasoline | 12529 |
| 9 SFS | 1FMEU15N3NLA77127 | Bronco | 92 | Gasoline | 13835 |
| 12 RS | 1FMEV15N7NLA77129 | Bronco | 92 | Gasoline | 1050 |
| 9 RW/SE | 1FMEU15N1RLA41846 | Bronco | 94 | Gasoline | 14821 |
| 9 SFS | 1GNCT18W62K216243 | Blazer | 02 | Gasoline | 21211 |
| 9 SFS | 1GNCT18W82K217331 | Blazer | 02 | Gasoline | 9560 |
| 9 IS | 1FMZU70E23UC06042 | Explorer | 03 | Gasoline | 8994 |
| 9 IS | 1FMZU70E43UC06043 | Explorer | 03 | Gasoline | 5603 |
| 9 IS | 1FMZU70E93UC06040 | Explorer | 03 | Gasoline | 915 |
| 9 CES | 1FMZU70E03UC06041 | Explorer | 03 | Gasoline | 5503 |
| 9 RW/SE | 1J4FJ27S7TL247507 | Cheroke | 96 | Gasoline | 1523 |
| 9 SFS | 1J4FJ27S9TL247508 | Ceroke | 96 | Gasoline | 6070 |
| 9 SFS | 1FMCU24X9VUC58002 | Explorer | 97 | Gasoline | 15204 |
| 9 CES | 1FTYR10D21PB63310 | 1/4 Ton P/U | 01 | Gasoline | 1252 |
| 9 SDS | 1FTYR10D41PB63311 | 1/4 Ton P/U | 01 | Gasoline | 0 |
| 9 OSS | 1FT4R10D61PB63312 | 1/4 Ton P/U | 01 | Gasoline | 6207 |
| 940 ARW | 1GCCS14H338207064 | 1/4 Ton P/U | 03 | Gasoline | 3675 |
| 940 ARW | 1FTYR10D84PB26928 | 1/4 Ton P/U | 04 | Gasoline | 0 |
| 9 MDG | 1FTYR10D84PB26931 | 1/4 Ton P/U | 04 | Gasoline | 207 |
| 9 SDS | 1FTYR10D84PB19607 | 1/4 Ton P/U | 04 | Gasoline | 2577 |
| 9 MOS | 1FTYR10D14PB26933 | 1/4 Ton P/U | 04 | Gasoline | 72 |
| 9 SDS | 1FTYR10D64PB26930 | 1/4 Ton P/U | 04 | Gasoline | 0 |
| 9 SDS | 1FTYR10DX4PB26932 | 1/4 Ton P/U | 04 | Gasoline | 3379 |
| 9 SDS | 1FTYR10DX4PB26929 | 1/4 Ton P/U | 04 | Gasoline | 0 |
| 9 SDS | JB7FL54E1HP025478 | 1/4 Ton P/U | 87 | Gasoline | 759 |
| 9 AMXS | JB7FL54E3HP025501 | 1/4 Ton P/U | 87 | Gasoline | 1243 |
| 9 CES | JB7FL54E4HP025538 | 1/4 Ton P/U | 87 | Gasoline | 11344 |
| 9 CES | JB7FL54E6HP024682 | 1/4 Ton P/U | 87 | Gasoline | 2604 |
| 9 MUNS | 1GCBS14EXJ8146228 | 1/4 Ton P/U | 88 | Gasoline | 2763 |
| 9 PSPTS | 1GCBS14E8J8146342 | 1/4 Ton P/U | 88 | Gasoline | 231 |
| 9 CES | 1GCBS14E0J8146349 | 1/4 Ton P/U | 88 | Gasoline | 6480 |
| 9 PSPTS | 1GCBS14E4J8146452 | 1/4 Ton P/U | 88 | Gasoline | 1168 |
| 9 CES | 1GCBS14E6J8146470 | 1/4 Ton P/U | 88 | Gasoline | 3787 |

Table D-2 LDGT1 Government Owned Vehicle at Beale AFB

| Organization | Vin Number | Vehicle Description | Model Year | Fuel Type | 2004 Mileage |
|--------------|-------------------|---------------------|------------|-----------|--------------|
| 9 SDS | 1GCB514EXJ8146001 | 1/4 Ton P/U | 88 | Gasoline | 3127 |
| 9 CS | 1GCB514E6J8146579 | 1/4 Ton P/U | 88 | Gasoline | 2307 |
| 940 ARW | 1GCB514E6J8145528 | 1/4 Ton P/U | 88 | Gasoline | 1518 |
| 940 ARW | 1GCB514E2J8145493 | 1/4 Ton P/U | 88 | Gasoline | 1361 |
| 9 CS | 1GCB514E4J8146001 | 1/4 Ton P/U | 88 | Gasoline | 3776 |
| 9 SDS | 1B7FN14X5J9792449 | 1/4 Ton P/U | 88 | Gasoline | 7128 |
| 940 ARW | 1B7FN14X0JS792567 | 1/4 Ton P/U | 88 | Gasoline | 3292 |
| 9 CS | 1FTCR10A8LUB98244 | 1/4 Ton P/U | 90 | Gasoline | 1298 |
| 9 AMXS | 1FTCR10AXLOB98245 | 1/4 Ton P/U | 90 | Gasoline | 2186 |
| 9 MUNS | 1FTCR10A1LUB98246 | 1/4 Ton P/U | 90 | Gasoline | 19715 |
| 9 MXS | 1FTCR10A3LUB98247 | 1/4 Ton P/U | 90 | Gasoline | 9191 |
| 9 AMXS | 1FTCR10A5LUB98248 | 1/4 Ton P/U | 90 | Gasoline | 2595 |
| 9 MDG | 1FTCR10A7LUB98249 | 1/4 Ton P/U | 90 | Gasoline | 2080 |
| 940 ARW | 1FTCR10A5LUB98184 | 1/4 Ton P/U | 90 | Gasoline | 8769 |
| 940 ARW | 1GCCS14Z3S8230559 | 1/4 Ton P/U | 95 | Gasoline | 7285 |
| 9 MXS | 1GCCS14ZXS8241820 | 1/4 Ton P/U | 95 | Gasoline | 4633 |
| 9 SDS | 1GCCS14Z358243926 | 1/4 Ton P/U | 95 | Gasoline | 10332 |
| 9 MXS | 1GCCS14Z1S8245917 | 1/4 Ton P/U | 95 | Gasoline | 2025 |
| 9 RW/SE | 1GCCS14ZXS8245639 | 1/4 Ton P/U | 95 | Gasoline | 1343 |
| 9 MDG | 1GCCS14Z5S8244530 | 1/4 Ton P/U | 95 | Gasoline | 4559 |
| 9 AMXS | 1GCCS14Z3S8242646 | 1/4 Ton P/U | 95 | Gasoline | 1821 |
| 1 RS | 1GCCS14ZXS8244944 | 1/4 Ton P/U | 95 | Gasoline | 6726 |
| 9 CES | 1GCCS14Z1S8244945 | 1/4 Ton P/U | 95 | Gasoline | 968 |
| 9 RW/SE | 1GCCS14Z5S8243913 | 1/4 Ton P/U | 95 | Gasoline | 2976 |
| 9 CES | 1GCCS14Z7S8243704 | 1/4 Ton P/U | 95 | Gasoline | 5994 |
| 1 RS | 1GCCS14Z5S8244513 | 1/4 Ton P/U | 95 | Gasoline | 2102 |
| 9 CS | 1GCCS14Z0S8246508 | 1/4 Ton P/U | 95 | Gasoline | 1586 |
| 9 SVS | 1GCCS14ZXS8247276 | 1/4 Ton P/U | 95 | Gasoline | 2205 |
| 9 SVS | 1GCCS14Z5S8249243 | 1/4 Ton P/U | 95 | Gasoline | 3517 |
| 9 RW/SE | 1GCCS14Z5S8247203 | 1/4 Ton P/U | 95 | Gasoline | 4507 |
| 9 AMXS | 1GCCS14ZXS8221745 | 1/4 Ton P/U | 95 | Gasoline | 2248 |
| 9 CS | 1GCCS14Z4S8221711 | 1/4 Ton P/U | 95 | Gasoline | 826 |
| 9 MUNS | 1GCCS14Z7S8221346 | 1/4 Ton P/U | 95 | Gasoline | 4993 |
| 940 ARW | 1B7FL26X8TS609444 | 1/4 Ton P/U | 96 | Gasoline | 3846 |
| 9 AMXS | 1B7FL26X3TS625566 | 1/4 Ton P/U | 96 | Gasoline | 7715 |
| 9 SDS | 1B7FL26X5TS625567 | 1/4 Ton P/U | 96 | Gasoline | 4425 |
| 9 CS | 1B7FL26X7TS625568 | 1/4 Ton P/U | 96 | Gasoline | 1214 |
| 9 AMXS | 1B7FL26X2TS682258 | 1/4 Ton P/U | 96 | Gasoline | 7103 |
| 9 SFS | 1B7FL26X4TS682259 | 1/4 Ton P/U | 96 | Gasoline | 8721 |
| 9 CS | 1B7FL26X2TS682261 | 1/4 Ton P/U | 96 | Gasoline | 2182 |
| 9 CES | 1B7FL26X4TS682262 | 1/4 Ton P/U | 96 | Gasoline | 5763 |
| 9 CES | 1B7FL26X6TS682263 | 1/4 Ton P/U | 96 | Gasoline | 8600 |
| 9 MUNS | 1B7FL26X8TS682264 | 1/4 Ton P/U | 96 | Gasoline | 4807 |
| 9 OSS | 1B7FL26X1TS682266 | 1/4 Ton P/U | 96 | Gasoline | 317 |
| 9 CES | 1FTCR1OU8VUC63770 | 1/4 Ton P/U | 97 | Gasoline | 7412 |
| 9 SDS | 1FTCR1OUXVUC63771 | 1/4 Ton P/U | 97 | Gasoline | 13820 |
| 9 SDS | 1FTCR1OU3VUC63773 | 1/4 Ton P/U | 97 | Gasoline | 755 |
| 9 SDS | 1D7HA16N92J122366 | 1/2 Ton P/U | 02 | Gasoline | 10483 |
| 9 SDS | 1D7HA16N02J122367 | 1/2 Ton P/U | 02 | Gasoline | 10516 |

Table D-2 LDGT1 Government Owned Vehicle at Beale AFB

| Organization | Vin Number | Vehicle Description | Model Year | Fuel Type | 2004 Mileage |
|--------------------------------|--------------------|----------------------------|-------------------|-----------------------------|---------------------|
| 12 RS | 1FTRF17293NB76278 | 1/2 Ton P/U | 03 | Gasoline | 3576 |
| 12 RS | 1FTRF17253NB76276 | 1/2 Ton P/U | 03 | Gasoline | 3684 |
| 12 RS | 1FTRF17233NB76275 | 1/2 Ton P/U | 03 | Gasoline | 7706 |
| 12 RS | 1FTRF17273NB76277 | 1/2 Ton P/U | 03 | Gasoline | 4163 |
| 9 SVS | 1B7FD14H6HS346946 | 1/2 Ton P/U | 87 | Gasoline | 872 |
| 9 AMXS | 1B7FE16X2KS052940 | 1/2 Ton P/U | 89 | Gasoline | 5110 |
| 9 SDS | 1GTDC14Z5RZ556952 | 1/2 Ton P/U | 94 | Gasoline | 4068 |
| 9 AMXS | 1GTDC14Z8RZ556993 | 1/2 Ton P/U | 94 | Gasoline | 7322 |
| 9 IS | 1FTDF1720VKD16815 | 1/2 Ton P/U | 97 | Gasoline | 1185 |
| 9 CES | 1FTDF1722VKD16816 | 1/2 Ton P/U | 97 | Gasoline | 5607 |
| 9 CS | 1FTRF18223NB76282 | 1/2 Ton P/U | 03 | Gasoline | 3550 |
| 9 RW/SE | IGCEK14Z3PE224861 | 1/2 Ton P/U | 93 | Gasoline | 5362 |
| 9 CES | 1GCEK14Z7PE225494 | 1/2 Ton P/U | 93 | Gasoline | 6123 |
| 9 CES | 1GCCS14EXG8194809 | 1/4 Ton P/U TMT | 86 | Gasoline | 2976 |
| 9 CES | 1GCCS14E8G8194811 | 1/4 Ton P/U TMT | 86 | Gasoline | 4137 |
| 9 CES | 1GCCS14E1G8194813 | 1/4 Ton P/U TMT | 86 | Gasoline | 2841 |
| 9 CES | 1GCCS14E9G8194817 | 1/4 Ton P/U TMT | 86 | Gasoline | 3612 |
| 9 CES | 1GCCS14E7J8131433 | 1/4 Ton P/U TMT | 88 | Gasoline | 543 |
| 9 CES | 1GCCS14E4J8131437 | 1/4 Ton P/U TMT | 88 | Gasoline | 2715 |
| 9 CES | 1GCCS14E3J8131445 | 1/4 Ton P/U TMT | 88 | Gasoline | 1120 |
| 9 CES | 1GCCS14Z9P0173273 | 1/4 Ton P/U TMT | 93 | Gasoline | 8189 |
| 9 CES | 1GCCS14Z3P0173561 | 1/4 Ton P/U TMT | 93 | Gasoline | 7233 |
| 9 CES | 1GCFC24H5JZ229848 | 1/4 Ton P/U TMT | 88 | Gasoline | 12168 |
| 9 CES | 1GCFC24H2JZ222713 | 1/4 Ton P/U TMT | 88 | Gasoline | 8996 |
| 9 CES | 1GCFC24HXMZ164807 | 1/4 Ton P/U TMT | 91 | Gasoline | 6024 |
| 9 CES | 1GCFC24H3NE159909 | 1/4 Ton P/U TMT | 92 | Gasoline | 4634 |
| 9 CES | 1GCFC24HBRZ168950 | 1/4 Ton P/U TMT | 94 | Gasoline | 7433 |
| 9 SVS | 2B5WB3522LK750623 | Dodge Maxi-Wagon | 90 | Gasoline | 140 |
| 9 SVS | 1GA4G39R121237538 | Chevy Van | 02 | Gasoline | 2045 |
| 9 SVS | 1FDWE35ZX2HA63834 | Ford Van 350 | 02 | Gasoline | 3144 |
| 9 SVS | 1GCEC14XX422535050 | Chevy Pickup | 04 | Gasoline | 3808 |
| 9 SVS | 1GAHG39R821237276 | Van | 02 | Gasoline | 7211 |
| 9 SVS | 1FBS1633HA25708 | Ford 350 Club Wagon | 03 | Gasoline | 2333 |
| Average Model Year 1993 | | | | Total Annual Mileage | 634,317 |

Table D-3 LDGT2 Government Owned Vehicles at Beale AFB

| Organization | Vin Number | Vehicle Description | Model Year | Fuel Type | 2004 Mileage |
|--------------|--------------------|---------------------|------------|-----------|--------------|
| 12 RS | 1GBHG31U331219412 | Multistop | 03 | Gasoline | 2634 |
| 12 RS | 1GBHG31U131218453 | Multistop | 03 | Gasoline | 6633 |
| 12 RS | 1GBKG31U531218245 | Multistop | 03 | Gasoline | 7063 |
| 9 SDS | 1GBHG31U841226101 | Multistop | 04 | Gasoline | 3309 |
| 9 AMXS | 1GBHG31U641225528 | Multistop | 04 | Gasoline | 2040 |
| 9 CES | 1GBHG31U441224863 | Multistop | 04 | Gasoline | 8684 |
| 9 SDS | 1GBHG31U241225364 | Multistop | 04 | Gasoline | 2501 |
| 9 SDS | 1FTSW30P74ED26375 | 6 PAX P/U | 04 | Gasoline | 2254 |
| 9 SDS | 1FTSW30P94ED26376 | 6 Pax P/U | 04 | Gasoline | 2120 |
| 12 RS | 1FTRW12W94KC64521 | 6 Pax P/U | 04 | Gasoline | 16 |
| 12 RS | 1FTRW12W04KC64522 | 6 Pax P/U | 04 | Gasoline | 1330 |
| 12 RS | 1FTRW12W74KC64520 | 6 Pax P/U | 04 | Gasoline | 4391 |
| 940 ARW | 2FTJW35H2JCA39511 | 6 Pax P/U | 88 | Gasoline | 2278 |
| 9 MUNS | 1GCGR23K1KJ110355 | 6 Pax P/U | 89 | Gasoline | 3895 |
| 9 SVS | 1GCGR23K6KJ110089 | 6 Pax P/U | 89 | Gasoline | 5295 |
| 940 ARW | 1GCGR33K6MF302270 | 6 Pax P/U | 91 | Gasoline | 922 |
| 9 CES | 1GCGR33K6MF302737 | 6 Pax P/U | 91 | Gasoline | 5949 |
| 940 ARW | 2FTJW35H6PCA96982 | 6 Pax P/U | 93 | Gasoline | 8760 |
| 940 ARW | 2FTJW35H8PCA96983 | 6 Pax P/U | 93 | Gasoline | 2287 |
| 940 ARW | 2FTJW35HXPCA96984 | 6 Pax P/U | 93 | Gasoline | 5051 |
| 9 CES | 1FTSW31P14ED37399 | 6 Pax P/U | 04 | Gasoline | 1255 |
| 9 SDS | 2FTJW36H8LCA41779 | 6 Pax P/U | 90 | Gasoline | 5423 |
| 9 OSS | 2FTJW36H4PCB10134 | 6 Pax P/U | 93 | Gasoline | 7161 |
| 9 CS | 2FTJW36H5PCB10093 | 6 Pax P/U | 93 | Gasoline | 6157 |
| 9 CES | 1B7KD2413HS350685 | 1 Ton S&P | 87 | Gasoline | 2788 |
| 9 CES | 1B7KD24W4HS350707 | 1 Ton S&P | 87 | Gasoline | 5526 |
| 9 CES | 1B7KD2417HS355047 | 1 Ton S&P | 87 | Gasoline | 3232 |
| 9 SDS | 1GBGC34K3JE163270 | 1 Ton S&P | 88 | Gasoline | 1598 |
| 12 RS | 1GBGC34KXJE163394 | 1 Ton S&P | 88 | Gasoline | 1730 |
| 9 MXS | 1GBGC34K0JE163288 | 1 Ton S&P | 88 | Gasoline | 2725 |
| 9 CES | 1GBGC34K8JE163300 | 1 Ton S&P | 88 | Gasoline | 4056 |
| 9 CES | 1GBGC34KXJE163301 | 1 Ton S&P | 88 | Gasoline | 7749 |
| 9 CES | 1GBGC34K1JE163333 | 1 Ton S&P | 88 | Gasoline | 2906 |
| 9 CES | 1GBGC34K0JE163341 | 1 Ton S&P | 88 | Gasoline | 2714 |
| 9 SDS | 1GBGC34K2JE163339 | 1 Ton S&P | 88 | Gasoline | 2822 |
| 9 CES | 1GBGC34K5JE164088 | 1 Ton S&P | 88 | Gasoline | 5304 |
| 9 CES | 1GBGC34K4JE163195 | 1 Ton S&P | 88 | Gasoline | 2958 |
| 9 CES | 1GCHC33K4NJ321078 | 6 Pax P/U TMT | 92 | Gasoline | 6034 |
| 9 CES | 1GBGK34K6JE196122 | 1 Ton S&P TMT | 88 | Gasoline | 7190 |
| 9 SVS | 1GBTG31F2W1056209 | Chevy Bus | 98 | Gasoline | 4620 |
| 9 SVS | 2GAGG39K2MA129259 | Chevy Van | 91 | Gasoline | 1426 |
| 9 SVS | 2B5WB35721K750628 | Dodge Van | 90 | Gasoline | 140 |
| 9 SVS | 2B4GK23536MR143125 | Dodge Wagon | 91 | Gasoline | 3930 |
| 9 SVS | 1GTEC14HX52565213 | Chevrolet | 95 | Gasoline | 4844 |
| 9 SVS | 1FTDF1546NPA46127 | Ford Truck | 92 | Gasoline | 106 |

Table D-3 LDGT2 Government Owned Vehicles at Beale AFB

| Organization | Vin Number | Vehicle Description | Model Year | Fuel Type | 2004 Mileage |
|--------------------------------|--------------------|----------------------------|-------------------|-----------------------------|---------------------|
| 9 SVS | 1GDHC34K65E550411 | GMC Flat Bed | 95 | Gasoline | 378 |
| 9 SVS | 1ETHS24149TH835864 | Ford 3/4 Ton Van | 95 | Gasoline | 3011 |
| 9 SVS | 26JGG39K8P4505987 | Chevrolet Van | 92 | Gasoline | 50 |
| 9 SVS | 1FBS531L13HB25707 | Ford 350 Club Wagon | 03 | Gasoline | 7613 |
| Average Model Year 1994 | | | | Total Annual Mileage | 182,858 |

Table D-4 LDDT Government Owned Vehicles at Beale AFB

| Organization | Vin Number | Vehicle Description | Model Year | Fuel Type | 2004 Mileage |
|---------------------|-------------------|----------------------------|-------------------|------------------|---------------------|
| 9 SFS | 1GBHG31FX11238344 | Multistop | 01 | Diesel | 2345 |
| 9 SFS | 2GBGG31JXM4121165 | Multistop | 91 | Diesel | 11842 |
| 9 CES | 2GBGG31J1M4135911 | Multistop | 91 | Diesel | 3674 |
| 9 SFS | 2GBGG31J5M4128699 | Multistop | 91 | Diesel | 904 |
| 9 SFS | 2GCHG31J3P4122582 | Multistop | 93 | Diesel | 1803 |
| 9 SDS | 2GCHG31JXP4124636 | Multistop | 93 | Diesel | 1974 |
| 9 SDS | 2GCHG31J1P4123570 | Multistop | 93 | Diesel | 9802 |
| 9 CES | 1GBHG31Y5SF225068 | Multistop | 95 | Diesel | 5822 |
| 9 MXS | 1GBHG31Y2SF223732 | Multistop | 95 | Diesel | 3151 |
| 9 CES | 1GBHG31Y7SF223788 | Multistop | 95 | Diesel | 4570 |
| 9 SDS | 1GBHG31Y2SF224539 | Multistop | 95 | Diesel | 4219 |
| 9 SDS | 1GBHG31Y4SF225143 | Multistop | 95 | Diesel | 3409 |
| 9 SDS | 1GBHG31Y7SF224326 | Multistop | 95 | Diesel | 5263 |
| 9 MXS | 1GBHG31Y9SF225820 | Multistop | 95 | Diesel | 1826 |
| 9 AMXS | 1GBHG31Y3SF225747 | Multistop | 95 | Diesel | 2908 |
| 9 MXS | 1GBHG31Y0SF225883 | Multistop | 95 | Diesel | 1771 |
| 9 CES | 1GBHG31Y6SF224043 | Multistop | 95 | Diesel | 5693 |
| 9 MXS | 1GBHG31Y1SF224306 | Multistop | 95 | Diesel | 5221 |
| 9 AMXS | 1GBHG31Y0SF224281 | Multistop | 95 | Diesel | 5236 |
| 9 CES | 1GBHG31Y8SF225307 | Multistop | 95 | Diesel | 2243 |
| 9 LRS | 1GBHG31Y2SF223682 | Multistop | 95 | Diesel | 5779 |
| 9 SFS | 1GBHG31Y0SF225673 | Multistop | 95 | Diesel | 6154 |
| 9 AMXS | 1GBHG31Y9SF224456 | Multistop | 95 | Diesel | 3992 |
| 9 AMXS | 1GBHG31Y6SF229193 | Multistop | 95 | Diesel | 10616 |
| 9 AMXS | 1GBHG31Y5SF227743 | Multistop | 95 | Diesel | 2341 |
| 9 MXS | 1GBHG31Y2SF227957 | Multistop | 95 | Diesel | 1991 |
| 9 MXS | 1GBHG31Y1SF228050 | Multistop | 95 | Diesel | 1684 |
| 9 MXS | 1GBHG31YXSF228774 | Multistop | 95 | Diesel | 1837 |
| 9 CES | 1GBHG31Y0SF228458 | Multistop | 95 | Diesel | 5833 |
| 9 PSPTS | 1GBHG31Y0SF227861 | Multistop | 95 | Diesel | 492 |
| 9 SDS | 1GBHG31Y8SF229227 | Multistop | 95 | Diesel | 4246 |
| 9 AMXS | 1GBHG31Y25F228297 | Multistop | 95 | Diesel | 3893 |
| 9 MXS | 1GBHG31Y6SF228366 | Multistop | 95 | Diesel | 2068 |
| 9 CES | 1GBHG31Y1SF228890 | Multistop | 95 | Diesel | 3318 |
| 9 SVS | 1GBHG31Y5SF227922 | Multistop | 95 | Diesel | 2427 |
| 9 AMXS | 1GBHG31Y3SF228566 | Multistop | 95 | Diesel | 11768 |
| 9 SFS | 1GBHG31F8X1153284 | Multistop | 99 | Diesel | 5052 |
| 9 MOS | 1GNGR26J9FK167240 | Multistop | 89 | Diesel | 1533 |
| 9 SFS | 1FTSW30F02ED65250 | 6 Pax P/U | 02 | Diesel | 4788 |
| 9 SFS | 1FTSW30F22ED65251 | 6 Pax P/U | 02 | Diesel | 3289 |
| 12 RS | 1FTSW30P83ED01483 | 6 Pax P/U | 03 | Diesel | 7826 |
| 12 RS | 1FTSW30P63ED01482 | 6 Pax P/U | 03 | Diesel | 5744 |
| 12 RS | 1FTSW30P63ED01482 | 6 Pax P/U | 03 | Diesel | 11843 |
| 12 RS | 1FTSW30P23ED01480 | 6 Pax P/U | 03 | Diesel | 6384 |
| 12 RS | 1FTSW30P13ED01485 | 6 Pax P/U | 03 | Diesel | 10185 |
| 12 RS | 1FTSW30PX3ED01484 | 6 Pax P/U | 03 | Diesel | 7505 |

Table D-4 LDDT Government Owned Vehicles at Beale AFB

| Organization | Vin Number | Vehicle Description | Model Year | Fuel Type | 2004 Mileage |
|--------------------------------|-------------------|----------------------------|-------------------|-----------------------------|---------------------|
| 9 SDS | 1GCGR2331JJ136573 | 6 Pax P/U | 88 | Diesel | 3036 |
| 9 CS | 1GCGC33F3WF037542 | 6 Pax P/U | 98 | Diesel | 5027 |
| 9 AMXS | 1GCGC33F6WF036935 | 6 Pax P/U | 98 | Diesel | 15272 |
| 9 MDG | 1FTSW31P53EC91686 | 6 Pax P/U | 03 | Diesel | 6902 |
| 9 CES | 1FTSW31P99EC91685 | 6 Pax P/U | 03 | Diesel | 757 |
| 9 SFS | 1GCHV33J3JJ138878 | 6 Pax P/U | 88 | Diesel | 5338 |
| 9 CES | 1GCHV33J1JJ144646 | 6 Pax P/U | 88 | Diesel | 4216 |
| 9 MXS | 1FTJW36M0REA19791 | 6 Pax P/U | 94 | Diesel | 1995 |
| 9 SFS | 1FTJW36M0REA19792 | 6 Pax P/U | 94 | Diesel | 12992 |
| 9 SDS | 1FDNF20P03ED31824 | 1 Ton S&P | 03 | Diesel | 7625 |
| 9 CES | 1FDNF20P23ED31825 | 1 Ton S&P | 03 | Diesel | 3004 |
| 9 MUNS | 1FDNF20P14ED75848 | 1 Ton S&P | 04 | Diesel | 15 |
| 9 CES | 1GBGC24J2ME154842 | 1 Ton S&P | 91 | Diesel | 7560 |
| 9 SDS | 1GBGC24J1PE147174 | 1 Ton S&P | 93 | Diesel | 4415 |
| 9 CES | 1GBGC24J9PE148752 | 1 Ton S&P | 93 | Diesel | 16675 |
| 9 SFS | 1GBGC24J6PE147798 | 1 Ton S&P | 93 | Diesel | 3357 |
| 9 CES | 1GBGC24J7PE147406 | 1 Ton S&P | 93 | Diesel | 4486 |
| 9 MUNS | 1HTLAHEK8FHA21732 | 1 Ton S&P | 85 | Diesel | 798 |
| 9 SDS | 1HTLAHEK7HHA18680 | 1 Ton S&P | 87 | Diesel | 398 |
| 12 RS | 1FDWF36P33ED67279 | 1.5 Ton S&P | 03 | Diesel | 897 |
| 9 IS | 1GBJC34264E388695 | 1.5 Ton S&P | 04 | Diesel | 109 |
| 9 SDS | 1HTLAHEK6FHA39498 | 1.5 Ton S&P | 85 | Diesel | 1529 |
| 9 SDS | 1GBHR34J2JJ125482 | 1.5 Ton S&P | 88 | Diesel | 672 |
| 9 SDS | 1GBHR34J1JJ125604 | 1.5 Ton S&P | 88 | Diesel | 1655 |
| 9 MDG | 1GBHR34J1JJ125635 | 1.5 Ton S&P | 88 | Diesel | 354 |
| 9 MUNS | 1GBHR34J2KJ109722 | 1.5 Ton S&P | 89 | Diesel | 3385 |
| 9 MXS | 1GBHC34J7ME179746 | 1.5 Ton S&P | 91 | Diesel | 2875 |
| 9 MXS | 1GBHC34J7ME178967 | 1.5 Ton S&P | 91 | Diesel | 3866 |
| 9 SDS | 1GBHC34FIVF041093 | 1.5 Ton S&P | 97 | Diesel | 3436 |
| Average Model Year 1996 | | | | Total Annual Mileage | 338,910 |

Table D-5 HDDV Government Owned Vehicles at Beale AFB

| Organization | Vin Number | Vehicle Description | Model Year | Fuel Type | 2004 Mileage |
|--------------|-------------------|---------------------|------------|-----------|--------------|
| 9 SDS | 1T88G2C2941143955 | 28 Pax Bus | 03 | Diesel | 2530 |
| 940 ARW | 1HTLDUYN6EH46425 | 28 Pax Bus | 84 | Diesel | 1806 |
| 9 SDS | 1HVLNHGL1HH516182 | 28 Pax Bus | 87 | Diesel | 3014 |
| 940 ARW | 1BAABCSA7RF06011 | 28 Pax Bus | 94 | Diesel | 5935 |
| 9 SDS | IHLVLPYL9EHA48995 | 44 Pax Bus | 84 | Diesel | 3860 |
| 9 MUNS | IHLVPHYLXEA51968 | 44 Pax Bus | 84 | Diesel | 1080 |
| 9 MUNS | IHLVPHXM9EHA27011 | 44 Pax Bus | 84 | Diesel | 1667 |
| 9 SDS | 1HVBBZVN7LH244269 | 44 Pax Bus | 89 | Diesel | 18019 |
| 9 MDG | 1FDKF37M2PNA72456 | Ambulance | 93 | Diesel | 7272 |
| 9 MDG | 1GBJC34FIRE205178 | Ambulance | 94 | Diesel | 4851 |
| 9 MDG | 1FDKF38MXKNB76751 | Ambulance | 90 | Diesel | 1607 |
| 9 MDG | 1FDKF38M4KNB60819 | Ambulance | 90 | Diesel | 12571 |
| 9 CES | 1FVHBXCS24HM33947 | Dump Truck | 03 | Diesel | 3072 |
| 9 CES | 1FVHBXCS04HM33946 | Dump Truck | 03 | Diesel | 2958 |
| 9 CES | 1FDYL90A4KUA21653 | 10 Ton Trk Trac | 89 | Diesel | 1458 |
| 9 MXS | 1FDYL90A6KVA21654 | 10 Ton Trk Trac | 89 | Diesel | 1093 |
| 9 MXS | 1FDYL90A3KUA21059 | 10 Ton Trk Trac | 89 | Diesel | 4975 |
| 9 MUNS | 1FDYL90A7LVA34382 | 10 Ton Trk Trac | 90 | Diesel | 1230 |
| 9 MUNS | 1FDYW82E3PVA19420 | 10 Ton Trk Trac | 92 | Diesel | 1002 |
| 9 SDS | 1FDYW82E4PVA20852 | 10 Ton Trk Trac | 92 | Diesel | 3415 |
| 9 MUNS | 1FDYW82E0PVA17088 | 10 Ton Trk Trac | 92 | Diesel | 981 |
| 9 MUNS | 1FDYW82E6RVA35727 | 10 Ton Trk Trac | 94 | Diesel | 5594 |
| 9 SDS | 1FDYW82E8RVA35728 | 10 Ton Trk Trac | 94 | Diesel | 319 |
| 9 MUNS | 1FDYU90V2VVA07559 | 10 Ton Trk Trac | 96 | Diesel | 4377 |
| 9 MUNS | 1FDYU90V9VVA07560 | 10 Ton Trk Trac | 96 | Diesel | 1905 |
| 9 SDS | 1FDYU90V0VVA07561 | 10 Ton Trk Trac | 96 | Diesel | 1631 |
| 9 IS | 1FDYU90V2VVA07562 | 10 Ton Trk Trac | 96 | Diesel | 1462 |
| 9 SDS | 1FDYU90T2VVA04854 | 10 Ton Trk Trac | 96 | Diesel | 4548 |
| 9 SDS | 1FDYU90T2VVA04855 | 10 Ton Trk Trac | 96 | Diesel | 5962 |
| 9 SDS | 1FDXF80E2SVA10909 | Wrecker | 95 | Diesel | 1089 |
| 9 SDS | 1FDXF80C4TVA06232 | Roll Back Retvr | 95 | Diesel | 2530 |
| 9 CES | 1GBHR33JIMF303259 | 6 Pax P/U TMT | 91 | Diesel | 12946 |
| 9 SVS | VVA42015 | Frefer Truck | 97 | Diesel | 1767 |
| 9 LRS | 1HTSEPLN4NH417983 | 1200 Gal Fuel Trk | 92 | Diesel | 4468 |
| 9 LRS | 1HTSEPLNXPH417991 | 1200 Gal Fuel Trk | 92 | Diesel | 2904 |
| 9 IS | 1HTLLUYRXGHA45382 | Water Truck | 86 | Diesel | 78 |
| 9 CES | 1HTAA1757DHA13995 | Dump Truck | 83 | Diesel | 1116 |
| 9 CES | 1HTAA1757DHA13999 | Dump Truck | 83 | Diesel | 733 |
| 9 CES | 1HTAA1757DHA14038 | Dump Truck | 83 | Diesel | 1028 |
| 9 CES | 1HTLCHWL2GHA47312 | Dump Truck | 86 | Diesel | 11637 |
| 9 CES | 1HTLCHWL5GHA47515 | Dump Truck | 86 | Diesel | 1613 |

Table D-5 HDDV Government Owned Vehicles at Beale AFB

| Organization | Vin Number | Vehicle Description | Model Year | Fuel Type | 2004 Mileage |
|--------------------------------|-------------------|----------------------------|-------------------|-----------------------------|---------------------|
| 9 CES | 1FDWK74C6PVA39394 | Dump Truck | 93 | Diesel | 3008 |
| 9 CES | 1FDWK74C9PVA38448 | Dump Truck | 93 | Diesel | 2416 |
| 9 CES | 1FDXF80C6SVA25444 | Dump Truck | 95 | Diesel | 6607 |
| 9 CES | 1GTS7D4G3EV534851 | Dump Truck | 84 | Diesel | 8036 |
| 9 CES | 1GTS7D4G5EV534866 | Dump Truck | 84 | Diesel | 1609 |
| 9 IS | 1FDYF80C0VVA28316 | Water Truck | 97 | Diesel | 3 |
| 9 IS | 1FDYF80C4VVA28318 | Water Truck | 97 | Diesel | 2 |
| 9 IS | 1FDYF80C4VVA28319 | Water Truck | 97 | Diesel | 188 |
| 9 CES/FD | 2HTTNDVR2HC006662 | Water Truck | 87 | Diesel | 1630 |
| 9 CES/FD | 1HTGLA6T6RH568610 | Water Truck | 94 | Diesel | 165 |
| 9 CES/FD | 1K9AF4488NN058515 | Fire Pumper | 92 | Diesel | 20 |
| 9 CES/FD | 1K9AF4281SN058130 | Fire Pumper | 95 | Diesel | 339 |
| 9 CES/FD | 1K9AF4284SN058235 | Fire Pumper | 95 | Diesel | 146 |
| 9 CES/FD | 10036 | Fire Pumper | 94 | Diesel | 77 |
| 9 CES/FD | 10175 | Fire Pumper | 95 | Diesel | 135 |
| 9 CES/FD | 10194 | Fire Pumper | 96 | Diesel | 12494 |
| 9 CES/FD | 31770 | Fire Pumper | 87 | Diesel | 384 |
| 9 CES/FD | 1FDKF38M2LNB00006 | Ramp Truck | 90 | Diesel | 2268 |
| 9 LRS | 1HTWGAAT65J044559 | R-11 Refueler | 04 | Diesel | 0 |
| 9 LRS | 1HTWGAAT75J044554 | R-11 Refueler | 04 | Diesel | 0 |
| 9 LRS | 1HTWGAAT35J044549 | R-11 Refueler | 04 | Diesel | 0 |
| 9 LRS | 10T2F3D07L1030203 | R-11 Refueler | 89 | Diesel | 2263 |
| 9 LRS | 2L1040416 | R-11 Refueler | 90 | Diesel | 507 |
| 9 LRS | 41616 | R-11 Refueler | 91 | Diesel | 16707 |
| 9 LRS | 41632 | R-11 Refueler | 91 | Diesel | 925 |
| 9 LRS | 4V2PCBNE5VR725583 | R-11 Refueler | 97 | Diesel | 11727 |
| 9 LRS | 4V2PCKNEXWN731503 | R-11 Refueler | 97 | Diesel | 710 |
| Average Model Year 1992 | | | | Total Annual Mileage | 224,469 |

Appendix E
Vehicle Monitoring Data

Figure E-1 Main Gate

— Channel 1

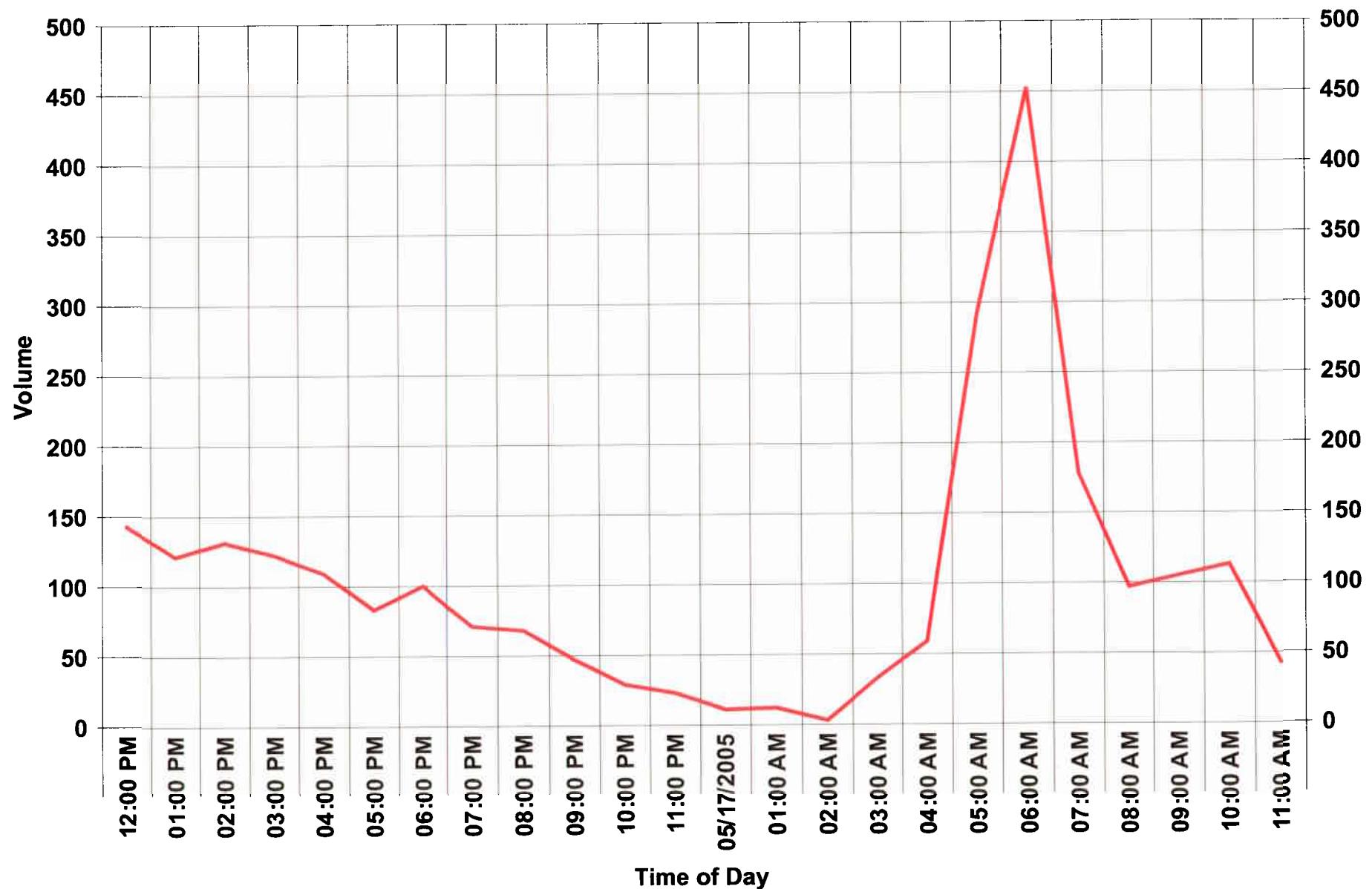


Figure E-2 Wheatland Gate

— Channel 1

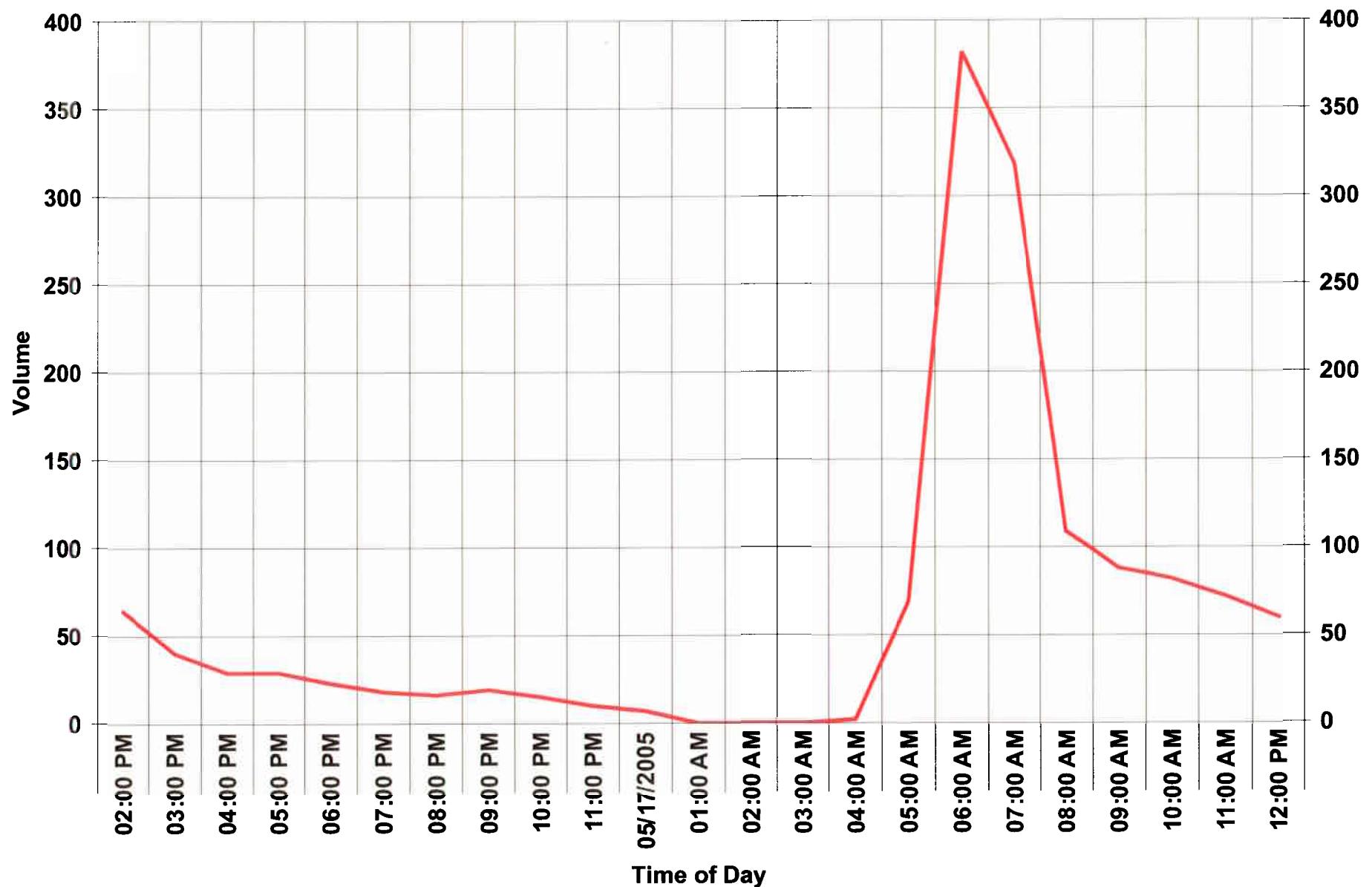


Figure E-3 Vasser Lake Gate

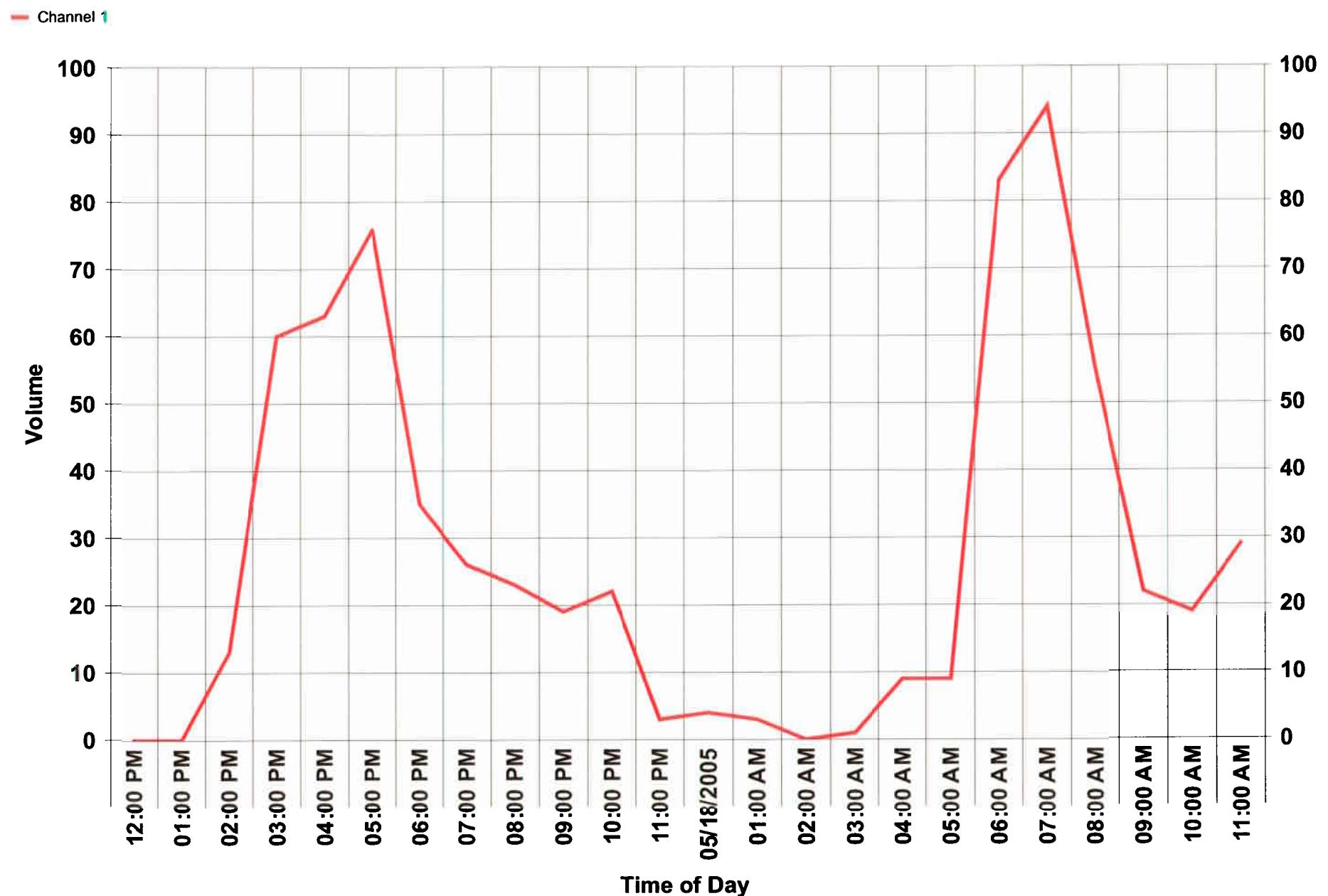


Figure E-4 Grass Valley Gate

— Channel 1

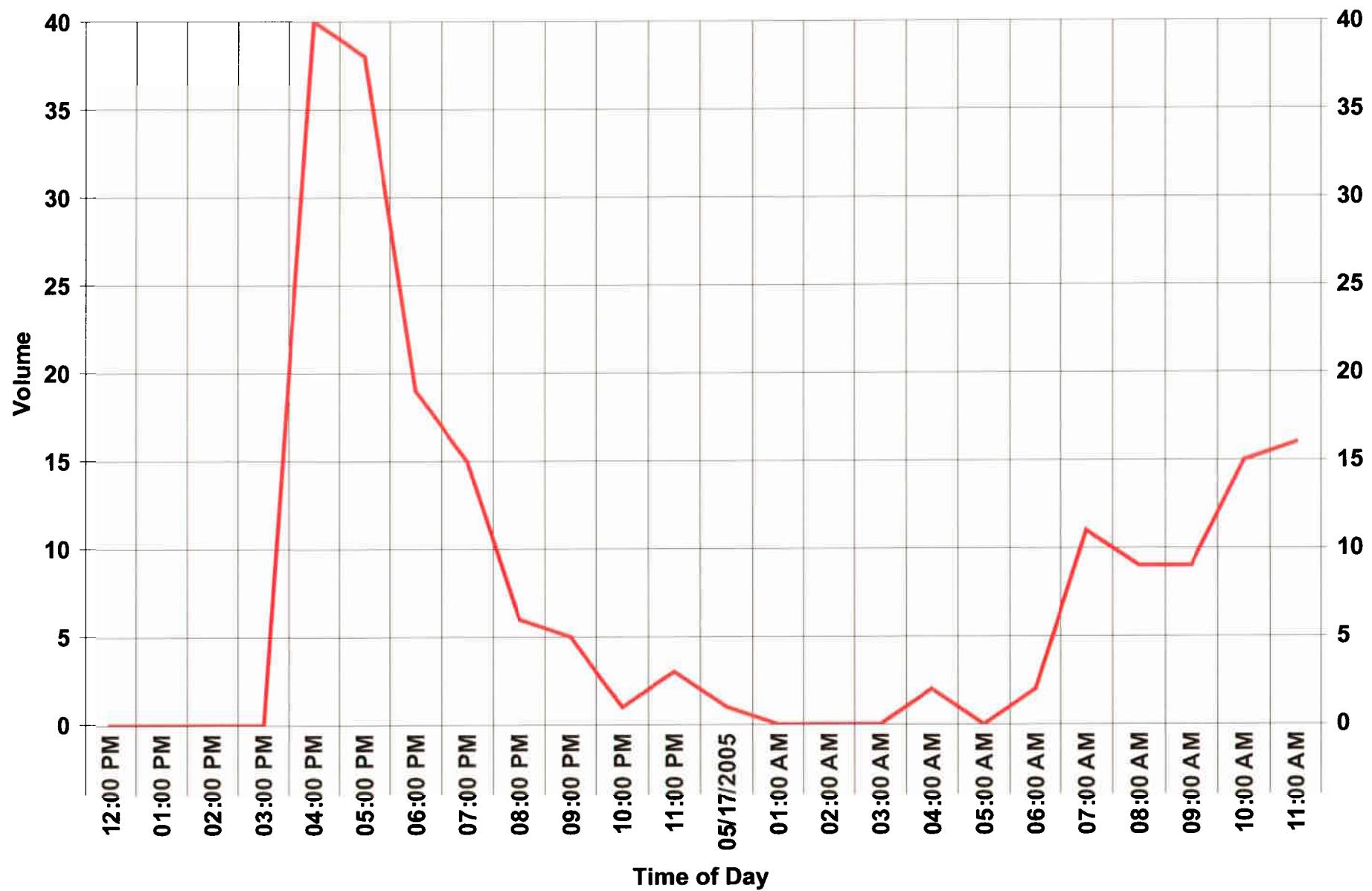


Figure E-5
L5 – One Direction, No Lane Separation
A to B – Basic, Bin

In this layout, both tubes (A and B) are extended across lanes to be studied. Channel A and channel B record dependent on each other.

The tubes should be spaced eight feet apart and be of equal length.

EXAMPLE: A car is traveling southbound, approaching the tubes. As the vehicle passes over both the A and B tubes, the time stamp for each pulse is recorded. These pulses can then be analyzed by the TRAXPro software to provide volume, class, speed and gap information.

